



## AN ANNOTATED BIBLIOGRAPHY ON PETROLEUM POLLUTION

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### **INTRODUCTION**

Petroleum has been recognized as a potential environmental contaminant since shortly after the beginning of the Twentieth Century. Reports of the biological consequences of ship wrecks involving cargos of crude and fuel oil began to appear in the popular and scientific press. Scientific literature on the subject was sparse until after World War II when reports of the effects of oil pollution began to appear with greater frequency. The wreck of the *Torrey Canyon* off the coast of England in 1967 stimulated worldwide interest in the effects of petroleum and cleanup methods on environmental resources. Research on the environmental effects of petroleum peaked during the 1970s and early 1980s. A recent surge of interest in North America was induced by the 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska. The accumulated literature on this well-studied contaminant is vast, covering topics as diverse as analytical chemistry, chemical fate, oil spill prevention and response, mitigation and restoration, economic and social analysis, and biological effects on all forms of plant and animal life in saltwater, freshwater, and terrestrial environments.

This bibliography is based on a personal reference collection exceeding 1500 citations and growing at an approximate rate of 50 citations per year. It is primarily a collection of published and readily accessible scientific reports appearing in journals, conference proceedings, serial publications, and books. Unpublished or poorly distributed reports are few. The collection is divided into 10 general categories; the first three categories (vertebrates) are represented completely and the fourth category (marine invertebrates) is nearing completion in this topical bibliography. The other six categories have only a few entries but all are receiving new references. Presently, there are 1,000 references in the database; old references will be added as time permits. The collection does not contain everything published on the subjects represented by the 10 categories, but it is representative of the published English-language literature. Books, international meetings, workshops, handbooks, government reports, published bibliographies, or non-technical books dealing with various aspects of oil pollution are not well represented in this bibliography; the emphasis is on original reports and a selection

of review articles and book chapters. As such, it is most useful for persons seeking detailed technical references or specialized reviews.

Each record consists of the full citation, a list of keywords, and one to three lines of text describing the contents of the reference. The keywords will assist with retrieval of references specified by the search option. The bracketed text describes the content of the reference. The 10 categories and their **primary category identifier** (a keyword) are Bird (**Oone**), Mammal (**Otwo**), Fish, Amphibian, and Reptile (**Othree**), Marine Invertebrate (**Ofour**), Freshwater Invertebrate (**Ofive**), Marine Plant (**Osix**), Freshwater Plant (**Oseven**), General Effect (**Oeight**), Technical (**Onine**), and Miscellaneous (**Oten**). If a reference contains information on chemical oil dispersants, it will have a “**D**” next to the “**O**”; for example, **ODone** is a petroleum and chemical dispersant reference with primary emphasis on birds. Some references overlap the category boundaries; they can be included in the retrieval by using the **primary category identifier** in combination with the name of the category (also a keyword), which serves as a secondary category identifier. Example: retrieval of all references that have any information about mammals will be accomplished with the search combination “**Otwo** or **ODtwo** or mammal”. Intentional redundancy in the keywords permits the category name “mammal” to be used for the same purpose. Other word combinations, such as, “mammal and dispersant” (all references on mammals and chemical dispersants) or “**Otwo** and freshwater” (references with primary focus on freshwater mammals) will retrieve subsets of the sources on mammals. Retrievals based solely on keywords that are not primary or secondary identifiers are likely to miss relevant references. Further, the search function is not limited to the keywords. Consequently, it is recommended that the **primary category identifiers** and secondary category identifiers (category names) be used to help with your search. Remember, only categories **Oone**, **Otwo**, and **Othree** are complete at this time.

In addition to the references in this topical bibliography, the user should consider the following collections of papers and publication series.

1. 1996. Proceedings of the *Exxon Valdez* Oil Spill Symposium, S.D. Rice, R.B. Spies, D.A. Wolfe, and B.A. Wright (Eds.). Am. Fish. Soc. Symposium 18, Am. Fish. Soc., Bethesda, MD. 931 pp. Contains 62 papers on the Exxon Valdez oil spill, none of which are referenced separately in this bibliography.
2. 1995. Exxon Valdez oil spill: fate and effects in Alaskan waters, P.G. Wells, J.N. Butler, and J.S. Hughes (Eds.). STP 1219, Am. Soc. for Testing and Materials, Conshohocken, PA. 965 pp. Contains 26 papers on the Exxon Valdez oil spill, none of which are referenced separately in this bibliography.
3. The biennial “Oil Spill Conference ” series has been published since 1973 by the American Petroleum Institute, Washington, DC. It contains many articles in each issue on a wide range of topics relevant to worldwide petroleum contamination. Some of these articles are referenced in this bibliography.

4. 1994. Marine mammals and the Exxon Valdez, T.R. Loughlin (Ed.). Academic Press, Inc., New York, NY. 395 pp. Contains 21 chapters, none of which are referenced separately in this bibliography.

## **BIBLIOGRAPHY**

**Anonymous** 1997. *Exxon Valdez Oil Spill Seabird Restoration Workshop*. Warheit KI, Harrison CS, and Divoky GJ (eds.), pp.1-171. Pacific Seabird Group. Seattle, WA.

Keywords : Exxon Valdez, spill, restoration, research, crude oil, Prudhoe Bay crude oil, policy, bird, mammal, fish, Oone, salt water, marine birds

[ Thirteen chapters describing the results of a workshop on restoration of seabirds affected by the 1989 Alaskan oil spill. The workshop was held in Girdwood, AK; participants wrote all or portions of the chapters. The workshop resulted in policy, research, and specific restoration recommendations.]

**Adams, N. J.** 1994. Patterns and impacts of oiling of African penguins *Spheniscus demersus*: 1981-1991. Biol. Conserv. **68**():35-41.

Keywords : penguin, distribution, oiled, annual, seasonal, population, rehabilitation, Oone, bird, salt water, oiling

[ Evaluation of the oiling of African penguins during the period 1981-91. Information on distribution of penguins, distribution of oiled penguins, annual and seasonal patterns of oiling, frequency and size of oiling events, and an assessment of the consequences of the oiling.]

**Ahsanullah, M., R. R. C. Edwards, D. G. Kay, and D. S. Negilski.** 1982. Acute toxicity to the crab *Paragrapsus quadridentatus* (H. Milne Edwards), of Kuwait light crude oil, BP/AB dispersant, and an oil-dispersant mixture. Australian J. Marine Freshwater Res. **33**():459-464.

Keywords : toxicity, crab, crude oil, dispersant, Kuwait crude oil, survival, salt water, marine invertebrate, ODFour, Australia, species, Kuwait, combination

[ One species of crab exposed to Kuwait crude oil, BP/AB dispersant, or a combination for 96 hr; calculation of 96 hr LC<sub>50s</sub>.]

**Ainley, D., C. R. Grau, S. Morrell, T. Roudybush, and J. Dobbs.** 1978. Reproductive responses of Cassin's auklets to orally administered Bunker C oil and eliminative responses in seabirds.

Anonymous. Fourth Annual Meeting, Pacific Seabird Group, pp.36-37. Pacific Seabird Group.

Keywords : Cassin's auklet, Bunker C, western gull, reproduction, elimination, Oone, salt water, bird, female, capsule, fuel oil, hatching, dosed, numbers, species, structure, rate

[ Female Cassin's auklets fed capsules containing 0, 300, or 600 mg Bunker C fuel oil. Comparisons made with undosed controls for laying, hatching, yolk structure, and fledging success. Subsequently dosed small numbers of six species of birds with Bunker C in capsules to determine rates of regurgitation or fecal elimination.]

**Ainley, D. G. and C. R. Grau.** 1978. Influence of petroleum on egg formation and embryonic development in seabirds. Wolfe DA (ed.), Marine Biological Effects of OCS Petroleum Development,

pp.188-198. ERL OCSEAP-1. NOAA.

Keywords : bird, Cassin's auklet, western gull, Bunker C, ingestion, capsule, reproduction, eggs, Oone, salt water, species

[ Effect of ingested Bunker C oil on reproduction in several species of birds.]

**Ainley, D. G., C. R. Grau, T. E. Roudybush, S. H. Morrell, and J. M. Utts.** 1981. Petroleum ingestion reduces reproduction in Cassin's auklet. *Marine Pollut. Bull.* **12**(9):314-317.

Keywords : ingestion, reproduction, Cassin's auklet, Bunker C, Prudhoe Bay crude oil, capsule, eggs, Oone, salt water, bird, Prudhoe Bay, crude oil

[ Effect of ingested Bunker C and Prudhoe Bay crude oil on reproduction in Cassin's auklet.]

**Akintonwa, A. and A. G. Ebere.** 1990. Toxicity of Nigerian crude oil and chemical dispersants to *Barbus* Sp. and *Clarias* Sp. *Bull. Environ. Contam. Toxicol.* **45**(5):729-733.

Keywords : toxicity, crude oil, dispersant, eggs, species, fish, fingerling, ODthree, Nigeria, fresh water

[ Effects on fingerlings and eggs of two species of fish from experimental exposure to local Nigerian crude oil and two chemical dispersants.]

**Al Bakri, D. and W. Kittaneh.** 1998. Physicochemical characteristics and pollution indicators in the intertidal zone of Kuwait: implications for benthic ecology. *Environ. Manage.* **22**(3):415-424.

Keywords : intertidal, Kuwait, sediment, structure, temperature, salinity, water, organic carbon, sulfide, Oten, salt water, miscellaneous, organic, carbon

[ Assessment of the intertidal zone of coastal Kuwait during 1984; serves as a pre-Gulf War benchmark. Used 35 transects perpendicular to the coastline. Measured sediment structure, temperature, salinity, pH, interstitial water, total organic carbon, and total dissolved sulfide.]

**Al-Abdali, F., M. S. Massoud, and A. N. Al-Ghadban.** 1996. Bottom sediments of the Arabian Gulf -- III. Trace metal contents as indicators of pollution and implications for the effect and fate of the Kuwait oil slick. *Environ. Pollut.* **93**(3):285-301.

Keywords : Arabian Gulf, sediment, metals, Gulf oil spill, crude oil, Oten, miscellaneous

[ Trace metals in sediments of the Arabian Gulf as an indicator of oil pollution.]

**Al-Hadhrami, M. N., H. M. Lappin-Scott, and P. J. Fisher.** 1996. Effects of the addition of organic carbon sources on bacterial respiration and *n*-alkane biodegradation of Omani crude oil. *Marine Pollut. Bull.* **32**(4):351-357.

Keywords : carbon, respiration, biodegradation, crude oil, bacteria, species, fertilizer, Corexit 9527, Corexit 9130, hydrocarbons, aliphatic, alkane, marine invertebrate, Ofour, salt water, molasses, degradation, composition

[ Biodegradation of Omani crude oil by one bacterium or a mixture of eight species of bacteria after addition of fertilizer, cane sugar molasses, Corexit 9527, or Corexit 9130. Measured respiration during degradation and hydrocarbon composition after 16 to 30 hr.]

**Al-Hadhrami, M. N., H. M. Lappin-Scott, and P. J. Fisher.** 1997. Studies on the biodegradation

of three groups of pure *n*-alkanes in the presence of molasses and mineral fertilizer by *Pseudomonas aeruginosa*. Mar. Pollut. Bull. **34**(11):969-974.

Keywords : biodegradation, fertilizer, alkane, bacteria, molasses, Oten, microbes, miscellaneous, degradation, species

[ Laboratory evaluation of the influence of molasses and mineral fertilizer on the degradation of pure alkanes by a species of bacteria.]

**Al-Hasan, R. H., D. A. Al-Bader, N. A. Sorkhoh, and S. S. Radwan.** 1998. Evidence for *n*-alkane consumption and oxidation by filamentous cyanobacteria from oil-contaminated coasts of the Arabian Gulf. Mar. Biol. **130**(5):521-527.

Keywords : Arabian Gulf, species, bacteria, incubation, alkane, petroleum hydrocarbons, Osix, marine plant, salt water

[ Laboratory evaluation of the ability of two species of cyanobacteria from the Arabian Gulf to consume and oxidize *n*-alkanes. The contribution of associated organotrophic bacteria to the overall reduction of *n*-alkanes was assessed and compared to that of the cyanobacteria. Incubation periods of up to 7 da were utilized.]

**Al-Lihaibi, S. S. and S. J. Ghazi.** 1997. Hydrocarbon distributions in sediments of the open area of the Arabian Gulf following the 1991 Gulf War oil spill. Mar. Pollut. Bull. **34**(11):941-948.

Keywords : petroleum hydrocarbons, distribution, sediment, Arabian Gulf, spill, survey, salt water, Oten, saturated hydrocarbons, miscellaneous, petroleum, hydrocarbons, saturated

[ Survey of petroleum hydrocarbons in the surface sediments of the off shore portions of the central Arabian Gulf. Measured total hydrocarbons and performed detailed analysis of the saturated hydrocarbons.]

**Al-Saad, H. T., S. M. Shamshoom, and J. K. Abaychi.** 1998. Seasonal distribution of dissolved and particulate hydrocarbons in Shatt Al-Arab estuary and the north-west Arabian Gulf. Mar. Pollut. Bull. **36**(10):850-855.

Keywords : seasonal, distribution, estuary, Arabian Gulf, petroleum hydrocarbons, aromatic, particulate, dissolved, concentration, Oten, salt water, miscellaneous, water, petroleum, hydrocarbons, time

[ Water was sampled at seven locations in the Shatt Al-Arab estuary and the north-west portion of the Arabian Gulf and analyzed for total petroleum hydrocarbons (aromatics via UVF analysis) in the dissolved and particulate phases. Sampling conducted five times between June 1993 and July 1994.]

**Al-Sarawi, M., M. S. Massoud, and F. Al-Abdali.** 1998. Preliminary assessment of oil contamination levels in soils contaminated with oil lakes in the Greater Burgan oil fields, Kuwait. Water Air Soil Pollut. **106**(3-4):493-504.

Keywords : soil, oil field, oil lakes, Kuwait, crude oil, petroleum hydrocarbons, organic carbon, metals, soil profile, Oten, miscellaneous, petroleum, region, hydrocarbons, organic, carbon

[ Assessment of the extent of petroleum contamination in the soils of the Southern Oil Lakes region of Kuwait. Two sites sampled and analyzed for total petroleum hydrocarbons, total organic carbon, and trace metals. Oil penetration through soil profiles measured also.]

**Al-Sarawi, M., M. S. Massoud, and S. A. Wahba.** 1998. Physical properties as indicators of oil penetration in soils contaminated with oil lakes in the greater Burgan oil fields, Kuwait. *Water Air Soil Pollut.* **102**(1-2):1-15.

Keywords : soil, oil field, Kuwait, soil profile, crude oil, miscellaneous, Oten

[ Eight soil profiles were dug in oil contaminated and oil-free portions of the Burgan oil fields of Kuwait. Sixty soil samples were taken from the profiles and analyzed for soil characteristics.]

**Al-Wadae, A. E. J. and E. Raveendran.** 1993. Determination of petroleum hydrocarbons in sediment, fish and air following the Gulf crisis in 1991. *Environ. Technol.* **14**(6):673-679.

Keywords : Othree, Bahrain, fish, concentration, aliphatic, aromatic, salt water, aromatic hydrocarbons, hydrocarbons, water

[ Concentration of aliphatic and aromatic hydrocarbons in fish caught in the waters around Bahrain in 1991, shortly after the Gulf War ended.]

**Al-yakoob, S., T. Saeed, and H. Al-hashash.** 1993. Polycyclic aromatic hydrocarbons in edible tissue of fish from the Gulf after the 1991 oil spill. *Marine Pollut. Bull.* **27**(3):297-301.

Keywords : Othree, aromatic hydrocarbons, salt water, fish, spill, concentration, muscle, species, Arabian Gulf, aromatic, hydrocarbons

[ Concentrations of selected aromatic hydrocarbons in muscle of six species of fish collected from the Arabian Gulf in 1992.]

**Al-Yakoob, S. N., D. Gundersen, and L. Curtis.** 1996. Effects of the water-soluble fraction of partially combusted crude oil from Kuwait's oil fires (from Desert Storm) on survival and growth of the marine fish *Menidia beryllina*. *Ecotoxicol. Environ. Safety* **35**(2):142-149.

Keywords : crude oil, survival, growth, fish, Kuwait crude oil, Othree, salt water

[ Effects on a marine fish of the water-soluble fraction of Kuwaiti crude oil or partially combusted crude oil from the oil well fires of the Gulf War.]

**Al-Yamani, F. Y., K. Al-Rifaie, and W. Ismail.** 1993. Post-spill zooplankton distribution in the NW Gulf. *Marine Pollut. Bull.* **27**(3):239-243.

Keywords : distribution, Arabian Gulf, spill, abundance, composition, zooplankton, salt water, Ofour, marine invertebrate

[ Sampling of zooplankton in the Arabian Gulf during April-May, 1992. Objective was to determine if oil spills from the Gulf War had affected zooplankton distribution, abundance, and composition.]

**Albers, P. H.** 1977. Effects of external applications of fuel oil on hatchability of mallard eggs. Wolfe DA (ed.), *Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems*, pp.158-163. Pergamon Press, Inc. New York, N.Y.

Keywords : hatchability, mallard, eggs, No.2 fuel oil, fresh water, reproduction, development, Oone, bird, fate, embryo, eggshell, fuel oil, paraffin, incubation, hatching, weight, duckling

[ Assessment of the effects of eggshell applications of No. 2 fuel oil (first publ. of this method).

Exposed artificially-incubated mallard eggs to 1, 5, 10, 20, or 50  $\mu$ l of No. 2 fuel oil, 50  $\mu$ l of paraffin mixture, or 50  $\mu$ l of propylene glycol on the day 8 of incubation. Measured hatching success, age at

death, and weight of ducklings.]

**Albers, P. H.** 1977. Effects of oil on aquatic birds. Fore PL (ed.), 1977 Oil Spill Response Workshop, FWS/OBS/77-24, pp.61-67. U.S. Fish and Wildlife Service. Washington, DC.

Keywords : bird, research, South Louisiana crude oil, No.2 fuel oil, Oone, spill

[ Overview of effects of oil on birds and recent research at the Patuxent Wildlife Research Center.]

**Albers, P. H.** 1978. Effects of petroleum on different stages of incubation in bird eggs. Bull. Environ. Contam. Toxicol. **19**():624-630.

Keywords : bird, eggs, crude oil, No.2 fuel oil, incubation, hatchability, mallard, fresh water, Oone, embryo, fuel oil, Louisiana crude oil, development, survival, hatching, weight

[ Effects of No. 2 fuel oil and South Louisiana crude oil on stages of embryo development in the mallard duck. Artificially-incubated eggs exposed to oil on days 2, 6, 10, 14, 18, or 22. Measured survival, days to death of embryo, and hatching weight.]

**Albers, P. H.** 1979. Effects of Corexit 9527 on the hatchability of mallard eggs. Bull. Environ. Contam. Toxicol. **23**():661-668.

Keywords : eggs, Prudhoe Bay crude oil, crude oil, Corexit 9527, hatchability, dispersant, fresh water, mallard, ODone, embryo, bird, eggshell, hatching, development, weight, duckling

[ Effects of Prudhoe Bay crude oil and Corexit 9527 on mallard eggs. Artificially-incubated eggs were exposed by eggshell application to varying amounts of either Prudhoe Bay crude oil, Corexit 9527, a 30:1 oil-dispersant mixture, or a 5:1 oil-dispersant mixture. Measured hatching success, stage of development at death, and hatching weight of ducklings.]

**Albers, P. H.** 1979. Oil dispersants and wildlife. Brown CH (ed.), 1979 U.S. Fish and Wildlife Service Pollution Response Workshop, pp.67-72. U.S. Fish and Wildlife Service. Washington, D.C.

Keywords : dispersant, bird, advantages, disadvantages, ODone, effects, fresh water, salt water

[ Presentation of the pros and cons of chemical dispersant use with particular reference to effects on birds.]

**Albers, P. H.** 1980. Transfer of crude oil from contaminated water to bird eggs. Environ. Research **22**():307-314.

Keywords : crude oil, transfer, eggs, Prudhoe Bay crude oil, hatchability, mallard, fresh water, Oone, embryo, bird, temperature, hatching, incubation, survival, duckling

[ Demonstration of the feasibility of parental transfer of surface oil by female mallards to their eggs. Incubating females exposed to water sources covered with either 5 or 100 ml of Prudhoe Bay crude oil. Thermocouple probes were used to monitor egg temperature. Measured hatching success, incubation temperature, and survival of ducklings to 1 wk of age.]

**Albers, P. H.** 1983. Effects of oil on avian reproduction: a review and discussion. Anonymous. The Effects of Oil on Birds. A Multi-discipline Symposium, pp.78-96. Tri-State Bird Rescue & Research, Inc. Newark, DE.

Keywords : embryo, bird, reproduction, review, fresh water, salt water, Oone, petroleum  
[ A review of the effects of petroleum on avian reproduction.]

**Albers, P. H.** 1984. Effects of oil and dispersants on birds. Anonymous. 1984 Region 9 Oil Dispersants Workshop, pp.101-110. U.S. Coast Guard. Santa Barbara, CA.

Keywords : vulnerability, dispersant, bird, ODone, salt water, fresh water, region  
[ General discussion of the effects of oil and dispersants on birds.]

**Albers, P. H.** 1991. Oil spills and the environment: a review of chemical fate and biological effects of petroleum. White J, Frink L, Williams TM, and Davis RW (eds.), The Effects of Oil on Wildlife, pp.1-11. Sheridan Press. Hanover, PA.

Keywords : effects, fate, petroleum, composition, plant, invertebrate, fish, amphibian, reptile, bird, mammal, habitat, salt water, fresh water, Oeight, general effect, marine invertebrate, freshwater invertebrate, marine plant, freshwater plant, review

[ A general discussion of the environmental fate and biological effects of petroleum. Author presents material on composition and characteristics of petroleum, environmental fate, biological effects (plants, invertebrates, fish, amphibians and reptiles, birds, mammals), and habitat considerations.]

**Albers, P. H.** 1995. Oil, biological communities and contingency planning. Frink L, Ball-Weir K, and Smith C (eds.), Wildlife and Oil Spills. Response, Research, and Contingency Planning, pp.1-9. Sheridan Press. Hanover, PA.

Keywords : community, spill, fate, petroleum, natural resource, restoration, diversity, oiled, rehabilitation, population, contingency, salt water, fresh water, Oten, miscellaneous, bird, mammal, amphibian, reptile, fish, marine invertebrate, freshwater invertebrate, marine plant, freshwater plant, general effect

[ A discussion of contingency planning for oil spills with regard to the requirements of the Oil Pollution Act of 1990. Author presents information on characteristics and fate of petroleum, biological effects of petroleum, and several special issues for contingency planners (natural resource restoration, biological diversity, oiled wildlife rehabilitation).]

**Albers, P. H.** 1995. Petroleum and individual polycyclic aromatic hydrocarbons. D. J. Hoffman, B. A. Rattner, J. G. A. Burton, and J. J. Cairns (eds.), Handbook of Ecotoxicology, pp.330-355. CRC Press, Boca Raton.

Keywords : petroleum, petroleum hydrocarbons, aromatic hydrocarbons, composition, fate, effects, sources, plant, invertebrate, fish, reptile, amphibian, bird, mammal, marine invertebrate, freshwater invertebrate, marine plant, freshwater plant, general effect, salt water, fresh water, Oeight

[ A general treatment of petroleum and PAHs including presentations on composition and characteristics, sources, environmental fate, and effects on plants, invertebrates, fish, reptiles and amphibians, birds, and mammals.]

**Albers, P. H., A. A. Belisle, D. M. Swineford, and R. J. Hall.** 1985. Environmental contamination in the oil fields of western Pennsylvania. Oil Petrochemical Pollut. **2**():265-280.

Keywords : oil field, effluent, discharges, stream, invertebrate, fish, salamander, mammal, aliphatic,



aromatic hydrocarbons, petroleum hydrocarbons, tissue, metals, conductivity, fresh water, Oeight, freshwater invertebrate

[ Assessment of the contaminantion of wildlife in the oil fields of western Pennsylvania. Collected effluent discharges, stream water conductivity, aquatic invertebrates, fish, salamanders, and small mammals during May 1980, August 1980, and June-July 1981. Analyzed all samples for a suite of 14 aliphatic and nine aromatic hydrocarbons and analyzed fish tissue for metals. Aquatic invertebrates were classified to family.]

**Albers, P. H. and M. L. Gay.** 1982. Unweathered and weathered aviation kerosine: chemical characterization and effects on hatching success of duck eggs. *Bull. Environ. Contam. Toxicol.* **28**():430-434.

Keywords : eggs, spill, mallard, reproduction, hatchability, fresh water, aviation kerosine, weathered, Oone, bird, pipeline, eggshell, incubation, hatching, aliphatic, aromatic

[ Effects of weathered aviation kerosine from a pipeline rupture in northern Virginia on mallard egg hatchability. Artificially-incubated mallard eggs were exposed by eggshell application to several amounts of weathered and unweathered aviation kerosine on day 6 of incubation. Measured hatching success of eggs and characterized the kerosine according to 14 aliphatic and 9 aromatic compounds.]

**Albers, P. H. and M. L. Gay.** 1982. Effects of a chemical dispersant and crude oil on breeding ducks. *Bull. Environ. Contam. Toxicol.* **29**():404-411.

Keywords : dispersant, crude oil, mallard, reproduction, Prudhoe Bay crude oil, Corexit 9527, fresh water, ODone, hatchability, embryo, bird, development, incubation, temperature, hatching, survival, duckling

[ Effects of chemically dispersed crude oil on mallard reproduction. Incubating female mallards were exposed to a water source treated with either Prudhoe Bay crude oil, Corexit 9527, or a combination of oil and dispersant during the first 10 da of development. Used thermocouple probes to monitor incubation temperature. Measured hatching success, incubation temperature, and survival of ducklings to 1 wk of age.]

**Albers, P. H. and G. H. Heinz.** 1983. FLIT-MLO and No. 2 fuel oil: effects of aerosol applications to mallard eggs on hatchability and behavior of ducklings. *Environ. Pollut.* **30**():381-388.

Keywords : FLIT-MLO, mallard, eggs, hatchability, larvacide, behavior, Oone, salt water, embryo, bird, development, duckling, fuel oil, No.2 fuel oil, avoidance, hatching

[ Effects of mosquito larvacide on mallard embryo development and behavior of ducklings. Exposed artificially-incubated mallard eggs on days 3, 6, 12, or 18 to sprayed applications of either No. 2 fuel oil or FLIT-MLO. Ducklings were tested for behavior avoidance at 2 da of age. Measured hatching success, stage of development at death, and avoidance response.]

**Albers, P. H. and R. C. Szaro.** 1978. Effects of No. 2 fuel oil on common eider eggs. *Marine Pollut. Bull.* **9**(5):138-139.

Keywords : eggs, common eider, salt water, reproduction, No.2 fuel oil, Maine, Oone, embryo, bird, fuel oil, eiders, eggshell, survival

[ Assessment of field applications of No. 2 fuel oil to naturally-incubated common eider eggs in Maine.

Eggs were exposed by eggshell applications to either 5  $\mu$ l No. 2 fuel oil or 20  $\mu$ l No. 2 fuel oil and opened 7 da later. Measured survival of embryos.]

**Alton, L. S.** 1995. Survival of *Penicillium* species in marine and river water contaminated with diesel oil, nitrogen, and phosphorus compounds. Arch. Environ. Contam. Toxicol. **29**(1):39-44.

Keywords : survival, species, nitrogen, phosphorus, phosphate, temperature, fresh water, nitrate, salt water, tolerance, Ofour, marine invertebrate, freshwater invertebrate, water

[ Exposure of four species of *Penicillium* fungi for 1-2 years, at different temperatures, to salt or fresh water containing diesel oil, nitrates, nitrites, or phosphates; an attempt to establish tolerance limits.]

**Alvarez-Legorreta, T., G. Gold-Bouchot, and O. Zapata-Perez.** 1994. Hydrocarbon concentrations in sediments and clams (*Rangia cuneata*) in Laguna de Pom, Mexico. Bull. Environ. Contam. Toxicol. **52**(1):39-45.

Keywords : hydrocarbons, concentration, sediment, Mexico, aliphatic, aromatic, unresolved complex mixture, coast, clam, Ofour, marine invertebrate, salt water

[ Analysis of hydrocarbons (aliphatics, aromatics, unresolved complex mixture) in the sediment and clams of a lagoon on the east coast of Mexico; an oil well and several oil-processing facilities located in and around the lagoon.]

**Amadi, A., S. D. Abbey, and A. Nma.** 1996. Chronic effects of oil spill on soil properties and microflora of a rainforest ecosystem in Nigeria. Water Air Soil Pollut. **86**(1-4):1-11.

Keywords : chronic, spill, soil, Nigeria, microbes, pipeline, crude oil, Ofive, freshwater invertebrate, fresh water

[ Measurement of soil and microbial characteristics along a transect line extending 2.5 km from a 1971 oil pipeline rupture in Nigeria.]

**Amadi, A., A. A. Dickson, and G. O. Maate.** 1993. Remediation of oil polluted soils: 1. Effect of organic and inorganic nutrient supplements on the performance of maize (*Zea may* L.). Water Air Soil Pollut. **66**(1-2):59-76.

Keywords : soil, growth, crude oil, corn, organic, inorganic, nutrients, remediation, Oseven, Nigeria, freshwater plant

[ Growth of corn in oil-contaminated (crude oil) soil supplemented with organic and inorganic nutrients.]

**Ameijeiras, A. H., J. S. Gandara, J. L. Hernandez, and J. S. Lozano.** 1994. Classification of the coastal waters of Galicia (NW Spain) on the basis of total aliphatic hydrocarbon concentrations in mussels (*Mytilus galloprovincialis*). Mar. Pollut. Bull. **28**(6):396-398.

Keywords : Spain, aliphatic, concentration, mussel, tissue, coast, petroleum hydrocarbons, salt water, Ofour, marine invertebrate

[ Background classification of the coastal waters of Galicia province in Spain according to the concentration of aliphatic hydrocarbons in soft tissue of a species of mussel. Sampled wild mussels from 11 sampling areas along the coast and four mussel raft farms located within the 11 natural sampling areas. Analyzed for selected aliphatic hydrocarbons.]

**Anderlini, V. C., L. Al-Harmi, B. W. DeLappe, R. W. Risebrough, W. Walker,II, B. R. T. Simoneit, and A. S. Newton.** 1981. Distribution of hydrocarbons in the oyster, *Pinctada margaritifera*, along the coast of Kuwait. *Marine Pollut. Bull.* **12**(2):57-62.

Keywords : distribution, hydrocarbons, oyster, coast, survey, aliphatic, aromatic, concentration, unresolved complex mixture, oil terminal, refinery, salt water, Ofour, marine invertebrate, Kuwait, petroleum

[ Survey of aliphatic (most data), aromatic, and unresolved hydrocarbons in oysters from the Gulf coast of Kuwait. Effort made to related concentrations to petroleum production, refining, and shipping areas.]

**Anderson, D. W., F. Gress, and D. M. Fry.** 1996. Survival and dispersal of oiled brown pelicans after rehabilitation and release. *Marine Pollut. Bull.* **32**(10):711-718.

Keywords : survival, oiled, brown pelican, rehabilitation, reproduction, dispersal, bird, Oone, salt water, activity, pelican, coast

[ Evaluation of the survival, dispersal, and reproductive activities of rehabilitated oiled brown pelicans on the west coast of the US.]

**Anderson, J. W., S. L. Kiesser, and J. W. Blaylock.** 1980. The cumulative effect of petroleum hydrocarbons on marine crustaceans during constant exposure. *Rapp. P. -v. Reun. Cons. int. Explor. Mer* **179**():62-70.

Keywords : petroleum hydrocarbons, crustacean, species, Prudhoe Bay crude oil, crude oil, experiment, aromatic, monoaromatic, toxicity index, time, survival, concentration, salt water, Ofour, marine invertebrate, Prudhoe Bay, toxicity, index, water

[ Exposure of three species of marine crustaceans for 4-11 da to an extract of Prudhoe Bay crude oil in laboratory experiments. The extract was 98% aromatics, mostly monoaromatics; the remainder were di- and triaromatics. Calculation of a toxicity index based on LC<sub>50</sub> and time of exposure; survival and water and crustacean concentrations of aromatics.]

**Anderson, J. W., S. L. Kiesser, D. L. McQuerry, and G. W. Fellingham.** 1985. Effects of oil and chemically dispersed oil in sediments on clams. Anonymous. 1985 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.349-353. American Petroleum Institute. Washington, DC.

Keywords : sediment, clam, species, crude oil, Corexit 9527, dispersant, concentration, tissue, survival, growth, Prudhoe Bay crude oil, amino acids, biochemical, salt water, marine invertebrate, ODfour, spill, behavior, Prudhoe Bay

[ Exposure of two species of clams to sediment containing Prudhoe Bay crude oil with or without Corexit 9527 dispersant for 1 to 6 mo. Measured oil concentrations in sediments and clam tissue, and survival, growth, and amino acid concentrations in clam tissue.]

**Anderson, J. W., R. Riley, S. Kiesser, and J. Gurtisen.** 1987. Toxicity of dispersed and undispersed Prudhoe Bay crude oil fractions to shrimp and fish. Anonymous. 1987 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.235-240. American Petroleum Institute, API Publ. 4452. Washington, DC.

Keywords : toxicity, crude oil, shrimp, fish, spill, ODthree, dispersant, Prudhoe Bay crude oil,

distillation fraction, marine invertebrate, species, Prudhoe Bay, water

[ Determination of the toxicity to a shrimp and a fish species of Prudhoe Bay crude oil and two distillation fractions of the crude oil. Chemically dispersed and water soluble fractions of each were used in the exposure trials.]

**Anderson, R. D.** 1975. Petroleum hydrocarbons and oyster resources of Galveston Bay, Texas.

Anonymous. 1975 Conference on Prevention and Control of Oil Pollution, pp.541-548. American Petroleum Institute. Washington, DC.

Keywords : petroleum hydrocarbons, oyster, Texas, experiment, aromatic, South Louisiana crude oil, accumulation, crude oil, No.2 fuel oil, Bunker C, saturated, depuration, Ofour, salt water, marine invertebrate, bivalve, petroleum, hydrocarbons, water, Kuwait, Louisiana, fuel oil

[ Field collections and experiments to assess the ability of oysters from the Galveston Bay area to accumulate and eliminate petroleum hydrocarbons. Field collected oysters were analyzed for hydrocarbons at collection and after a summer in clean water. Experiments exposed oysters to 1 or 5% oil-water mixtures of Kuwait or South Louisiana crude oils, No. 2 fuel oil, or Bunker C fuel oil for up to 7 da; oysters analyzed periodically for saturated and non-saturated hydrocarbons up to 52 da after exposure ended.]

**Anderson, R. D. and J. W. Anderson.** 1975. Effects of salinity and selected petroleum hydrocarbons on the osmotic and chloride regulation of the American oyster, *Crassostrea virginica*. *Physiol. Zool.* **48**(4):420-430.

Keywords : salinity, petroleum hydrocarbons, oyster, osmoregulation, fuel oil, South Louisiana crude oil, crude oil, No.2 fuel oil, chloride regulation, bivalve, Ofour, salt water, marine invertebrate, petroleum, regulation, Louisiana

[ Assessment of the influence of petroleum exposure on osmoregulation and chloride regulation in the oyster. Oysters exposed to 1% oil-water mixture of either No. 2 fuel oil or South Louisiana crude oil for 96 hr, then moved to seawater with different salinities for up to 17 days; osmo- and chloride regulation measured periodically during the 17 da period.]

**Andreassen, J. K. and R. W. Spears.** 1983. Toxicity of Texan petroleum well brine to the sheepshead minnow (*Cyprinodon variegatus*), a common estuarine fish. *Bull. Environ. Contam. Toxicol.* **30**(3):277-283.

Keywords : toxicity, estuarine, fish, species, shrimp, brine water, marine invertebrate, Texas, oilfield, Othree, salt water, water, sheepshead minnow

[ Toxicity to several species of fish and shrimp of brine water from a Texas oilfield; experimental exposure with primary emphasis on the sheepshead minnow.]

**Andres, B. A.** 1997. The *Exxon Valdez* oil spill disrupted the breeding of black oystercatchers. *J. Wildl. Manage.* **61**(4):1322-1328.

Keywords : Exxon Valdez, spill, oiled, reproduction, disruption, mussel, feeding, bird, Oone, salt water, black oystercatcher, season, activity, rate

[ Evaluation of the effects of the Exxon Valdez oil spill on black oystercatchers on an oiled island (Green Is.) and an unoiled island (Montague Is.). Data for 1989 and 1991 breeding seasons and

partial information for 1990, 1992, and 1993. Measured nesting activity, reproductive success, deaths of bay mussels, and feeding rates of adults at the nesting sites.]

**Anker-Nilssen, T., P. H. Jones, and O. W. Rostad.** 1988. Age, sex and origins of auks (Alcidae) killed in the Skagerrak oiling incident of January 1981. *Seabird* **11**(1):28-46.

Keywords : spill, auks, Denmark, morphometry, age, sex, bill, origin, wing, Oone, salt water, bird

[ Evaluation of the body characteristics of auks killed in an oil spill north of Denmark. The author attempts to determine origins of corpses based on measurements.]

**Anonymous.** 1972. A unique petroleum hydrocarbon for control of mosquito larvae. *Agrichemical Age* **15**(8):4-5.

Keywords : hydrocarbons, FLIT-MLO, larvacide, Oone, fresh water, salt water, bird

[ Discussion of FLIT-MLO for use as a mosquito larvacide.]

**Armstrong, H. W., K. Fucik, J. W. Anderson, and J. M. Neff.** 1979. Effects of oilfield brine effluent on sediments and benthic organisms in Trinity Bay, Texas. *Mar. Environ. Res.* **2**(1):55-69.

Keywords : oilfield, effluent, sediment, benthic, Texas, naphthalene, concentration, numbers, species, brine water, Ofour, salt water, marine invertebrate

[ Effects of oilfield brine effluent from an offshore oil platform in Trinity Bay, Texas were determined with the use of three sampling transects from April, 1974 through December, 1975. Monthly samples of sediment were analyzed for total naphthalene concentration and numbers and species of benthic organisms.]

**Atema, J.** 1977. The effects of oil on lobsters. *Oceanus* **20**(4):67-73.

Keywords : lobster, crude oil, concentration, La Rosa crude oil, No.2 fuel oil, behavior, Ofour, salt water, marine invertebrate, kerosene, fuel oil

[ Exposure of adult lobsters to kerosene, crude oil, and several concentrations of No. 2 fuel oil; measured behavioral responses.]

**Atlas, R. M.** 1978. Microorganisms and petroleum pollutants. *BioScience* **28**(6):387-391.

Keywords : commentary, petroleum hydrocarbons, spill, remediation, biodegradation, microbes, Oten, miscellaneous, hydrocarbons, petroleum

[ General commentary and discussion of the ability of microorganisms to degrade petroleum hydrocarbons and the implications for industry and oil spill remediation.]

**Augenfeld, J. M.** 1980. Effects of Prudhoe Bay crude oil contamination on sediment working rates of *Abarenicola pacifica*. *Mar. Environ. Res.* **3**(4):307-313.

Keywords : Prudhoe Bay crude oil, crude oil, sediment, lugworms, Ofour, marine invertebrate, salt water, Prudhoe Bay

[ Exposure of lugworms to sediment containing 0, 250, 500, or 1000 ppm of Prudhoe Bay crude oil for 11 da; measured amount of sediment processed by worms.]

**Augenfeld, J. M., J. W. Anderson, D. L. Woodruff, and J. L. Webster.** 1980. Effects of Prudhoe Bay crude oil-contaminated sediments on *Protothaca staminea* (Mollusca: Pelecypoda): hydrocarbon content, condition index, free amino acid level. *Mar. Environ. Res.* **4**(2):135-143.  
Keywords : Prudhoe Bay crude oil, sediment, condition, index, amino acids, clam, crude oil, aliphatic, aromatic, tissue, concentration, Ofour, salt water, bivalve, marine invertebrate, species, Prudhoe Bay, aromatic hydrocarbons, hydrocarbons  
[ Two species of clams exposed to sediment containing 1237 ppm of Prudhoe Bay crude oil in a field situation for 38 or 54 da. Measured aliphatic and aromatic hydrocarbon content of tissue, free amino acid concentration, and a 'condition index'.]

**Axiak, V. and J. J. George.** 1987. Bioenergetic responses of the marine bivalve *Venus verrucosa* on long-term exposure to petroleum hydrocarbons. *Mar. Environ. Res.* **23**(1):33-47.  
Keywords : bivalve, long-term, petroleum hydrocarbons, Kuwait crude oil, crude oil, feeding, condition, physiology, metabolism, Ofour, salt water, marine invertebrate, Kuwait, rate, food  
[ Exposure of bivalve *Venus verrucosa* to the water-accomodated fractions of Kuwait crude oil for 145 da. Measured feeding rates, food absorption efficiency, several physiological functions, and body condition indices.]

**Axiak, V. and L. J. Saliba.** 1981. Effects of surface and sunken crude oil on the behaviour of a sea urchin. *Mar. Pollut. Bull.* **12**(1):14-19.  
Keywords : sea urchin, weathered, crude oil, behavior, Ofour, marine invertebrate, salt water  
[ Exposure of a sea urchin to fresh or weathered surface or sunken crude oil, or water-soluble fractions of surface fresh crude oil (8, 16, 32 ppm) or sunken fresh crude oil (6, 11, 22 ppm); measured righting response.]

**Baden, S. P.** 1982. Impaired osmoregulation in the shrimp *Palaemon adspersus* exposed to crude oil extract. *Mar. Pollut. Bull.* **13**(6):208-210.  
Keywords : osmoregulation, shrimp, crude oil, North Sea crude oil, Ofour, salt water, marine invertebrate, North Sea  
[ Exposure of the shrimp *Palaemon adspersus* to 20, 70, 100, or 200 ppb of water-soluble fraction of North Sea crude oil for up to 34 da; measured osmoregulation.]

**Baillie, S. R. and T. J. Stowe.** 1984. A comparison between the percentage of seabirds reported as oiled from ringing recoveries and from the beached bird survey. *Seabird* **7**(1):47-54.  
Keywords : oiled, bird, banding recoveries, beached bird survey, England, Oone, salt water, oiling, rate, recovery, survey  
[ Comparison of oiling rates among birds from banding recovery and the beached bird survey in England.]

**Bak, R. P. M.** 1987. Effects of chronic oil pollution on a Caribbean coral reef. *Mar. Pollut. Bull.* **18**(10):534-539.  
Keywords : chronic, Caribbean, coral reef, refinery, survey, species, Aruba, Ofour, salt water, marine invertebrate, coral, coast

[ Documentation of the effects of 60 yr of chronic oil pollution near a refinery in Aruba; conducted a survey of coral species along the coast near the refinery.]

**Bak, R. P. M. and J. H. B. W. Elgershuizen.** 1976. Patterns of oil-sediment rejection in corals. *Mar. Biol.* **37**(2):105-113.

Keywords : sediment, behavior, species, Caribbean, coral, salt water, Ofour, marine invertebrate  
[ Assessment of the sediment rejection behavior of 19 species of Caribbean corals. Compared rejection of clean sediment particles with sediment-oil particles.]

**Baker, J. R., A. M. Jones, T. P. Jones, and H. C. Watson.** 1981. Otter *Lutra lutra* L. mortality and marine oil pollution. *Biol. Conserv.* **20**(3):311-321.

Keywords : sea otter, spill, Bunker C, fuel oil, Shetland, necropsy, pathology, salt water, Otwo, mammal, chemical analysis, stomach

[ Report of deaths of sea otters following a spill of Bunker C fuel oil at Sullom Voe Terminal in Shetland; necropsy and pathology results and chemical analysis of stomach contents.]

**Balba, M. T., R. Al-Daher, N. Al-Awadhi, H. Chino, and H. Tsuji.** 1998. Bioremediation of oil-contaminated desert soil: the Kuwaiti experience. *Environ. Internat.* **24**(1/2):163-173.

Keywords : bioremediation, soil, remediation, Kuwait, petroleum, salinity, microbes, degradation, crude oil, Oten, miscellaneous, methods, static, abundance

[ Evaluation of three remediation methods for treating oil-contaminated soil in Kuwait. Tested landfarming, windrow composting, and static bioventing piles. Measured petroleum degradation, microbial abundance, and soil salinity.]

**Barber, W. E., L. L. McDonald, W. P. Erickson, and M. Vallarino.** 1995. Effect of the *Exxon Valdez* oil spill on intertidal fish: a field study. Anonymous. *Transactions of the American Fisheries Society*, pp.461-476. American Fisheries Society.

Keywords : Exxon Valdez, spill, intertidal, fish, Prince William Sound, Prudhoe Bay crude oil, crude oil, Othree, species diversity, biomass, salt water

[ Assessment of the effect of the Exxon Valdez oil spill on intertidal fish of Prince William Sound; sampling performed in 1990 and 1991.]

**Barnett, J. and D. Toews.** 1978. The effects of crude oil and the dispersant, Oilsperse 43, on respiration and coughing rates in Atlantic salmon (*Salmo salar*). *Can. J. Zool.* **56**(2):307-310.

Keywords : crude oil, dispersant, respiration, Venezuelan crude oil, Atlantic salmon, weathered, coughing, fish, ODthree, fresh water, Atlantic, salmon, rate, emulsion

[ Effects on post-smolt Atlantic salmon coughing rates and respiration of exposure to emulsions of unweathered and weathered Venezuelan crude oil and the dispersant Oilsperse 43.]

**Barr-Nea, L. and M. Wolman.** 1977. Tumors and amyloidosis in mice painted with crude oil found on bathing beaches. *Bull. Environ. Contam. Toxicol.* **18**(3):385-391.

Keywords : Otwo, mammal, solvent extract, weathered, crude oil, mouse, amyloidosis, skin, solvent

[ Effects on mice of skin application of solvent extracts of weathered crude oil; applied twice weekly for 12 months.]

**Barrett, R. T.** 1979. Small oil spill kills 10-20000 seabirds in north Norway. *Marine Pollut. Bull.* **10**():253-255.

Keywords : spill, fuel oil, guillemot, Norway, Oone, salt water, bird, coast

[ Description of the seabirds killed in a small oil spill off the north coast of Norway.]

**Barron, M. G., T. Podrabsky, R. S. Ogle, J. E. Dugan, and R. W. Ricker.** 1999. Sensitivity of the mysid *Mysidopsis bahia* to a weathered oil. *Bull. Environ. Contam. Toxicol.* **62**(3):266-271.

Keywords : weathered, shrimp, California, temperature, oxygen, salinity, survival, growth, petroleum hydrocarbons, Ofour, salt water, marine invertebrate

[ Exposure of mysid shrimp to the water-accomodated fraction (WAF) of environmentally weathered oil from coastal California. Exposure levels were 1.25, 2.5, 5, 10, and 20 % WAF for 6 da.

Measured temperature, pH, dissolved oxygen, salinity, death, survival to 6 da, and growth. Exposure solutions analyzed for total petroleum hydrocarbons.]

**Barszcz, C., P. P. Yevich, L. R. Brown, J. D. Yarbrough, and C. D. Minchew.** 1978. Chronic effects of three crude oils on oysters suspended in estuarine ponds. *J. Environ. Pathol. Toxicol.* **1**():879-896.

Keywords : chronic, crude oil, oyster, estuarine, sediment, water, aromatic hydrocarbons, tissue, survival, pathology, concentration, Ofour, salt water, marine invertebrate, aromatic, hydrocarbons

[ Exposure of oysters in estuarine experimental ponds to 4 ppm of either Empire Mix, Saudi Arabian, or Nigerian crude oils. Oyster, sediment, and water samples taken for up to 9 mo. Measured aromatic hydrocarbon content of water, sediment, and oyster tissue, oyster survival, gross appearance of oysters, and a variety of histopathological comparisons.]

**Batten, S. D., R. J. S. Allen, and C. O. M. Wotton.** 1998. The effects of the Sea Empress oil spill on the plankton of the southern Irish Sea. *Mar. Pollut. Bull.* **36**(10):764-774.

Keywords : plankton, crude oil, zooplankton, phytoplankton, species, abundance, diversity, salt water, Ofour, marine invertebrate, marine plant

[ Effect of Sea Empress crude oil spill on the zooplankton and phytoplankton of the southern Irish Sea. Plankton sampling conducted since 1970 in the Irish Sea provided a background for comparison to the plankton species, abundance, and diversity during the year of the oil spill.]

**Battershill, C. N. and P. R. Bergquist.** 1982. Responses of an intertidal gastropod to field exposure of an oil and a dispersant. *Mar. Pollut. Bull.* **13**(5):159-162.

Keywords : intertidal, dispersant, weathered, survival, weight, gonads, index, tissue, condition, gastropod, ODfour, salt water, marine invertebrate, Maui condensate, shell, experiment

[ Exposure of a marine gastropod to fresh and weathered Maui condensate alone or combined with Shell SD LTX dispersant or to Shell SD LTX alone in a 3-wk field experiment. Measured survival,



weight, gonad weight, gonad index, and general tissue condition.]

**Bayer, R. D.** 1988. Changes in waterbird numbers before and after the 1983 oil spill at Yaquina Estuary, Oregon. *Oregon Birds* **14**(2):157-161.

Keywords : spill, Bunker C, diesel fuel, wintering, salt water, estuary, numbers, Oone, bird  
[ Changes in waterbird numbers as a result of a Bunker C and diesel fuel spill in Yaquina Estuary, Oregon.]

**Beaver, D. L.** 1982. Avian populations and hydrocarbon development at Baker Sanctuary. *The Jack-Pine Warbler* **60**(2)

Keywords : population, oilfield, bird, fresh water, Oone, hydrocarbons  
[ Assessment of the effects of well drilling adjacent to a bird sanctuary.]

**Beckmann, M., J. D. Hardege, and E. Zeeck.** 1995. Effects of the volatile fraction of crude oil on spawning behaviour of nereids (annelida, polychaeta). *Mar. Environ. Res.* **40**(3):267-276.

Keywords : crude oil, spawning, male, female, North Sea crude oil, distillation fraction, reproduction, polychaete, Ofour, salt water, marine invertebrate, species, North Sea  
[ Exposure of males and females from two polychaete species to EKO-FISK, North Sea crude oil or a distillation fraction of the crude oil; measured the reproductive behaviour.]

**Beer, J. V.** 1968. The attempted rehabilitation of oiled sea birds. *Wildfowl* **19**():120-124.

Keywords : oiled, bird, rehabilitation, salt water, Oone, methods  
[ Assessment of rehabilitation methods for birds in the late 60s.]

**Begg, G. S., J. B. Reid, M. L. Tasker, and A. Webb.** 1997. Assessing the vulnerability of seabirds to oil pollution: sensitivity to spatial scale. *Colonial Waterbirds* **20**(2):339-352.

Keywords : vulnerability, United Kingdom, Ireland, spatial scale, spill, Oone, bird, salt water, population  
[ Addressess the vulnerability of seabirds to oil pollution from the aspect of spatial scale. Uses the technique of area vulnerability scores (AVS), as used in the United Kingdom and Ireland, to demonstrate the effects of changing the scale of the areas of concern.]

**Benka-coker, M. O. and J. A. Ekundayo.** 1997. Applicability of evaluating the ability of microbes isolated from an oil spill site to degrade oil. *Environ. Monitor. Assess.* **45**():259-272.

Keywords : microbes, spill, hydrocarbons, soil, water, Nigeria, crude oil, salt water, degradation, Oten, miscellaneous  
[ Assessment of the hydrocarbon degradation potential of several taxa of microbes isolated from soil and water at an oil spill site in the Niger Delta of Nigeria.]

**Benville, P. E., Jr. and S. Korn.** 1977. The acute toxicity of six monocyclic aromatic crude oil components to striped bass (*Morone saxatilis*) and bay shrimp (*Crago franciscorum*). *Calif. Fish and Game* **63**(4):204-209.

Keywords : toxicity, aromatic, crude oil, shrimp, monoaromatic, striped bass, fish, marine invertebrate,

Othree, salt water, acute

[ Determination of acute toxicities of six monocyclic aromatics to striped bass and bay shrimp.]

**Berdugo, V., R. P. Harris, and S. C. O'Hara.** 1977. The effect of petroleum hydrocarbons on reproduction of an estuarine planktonic copepod in laboratory cultures. *Mar. Pollut. Bull.* **8**(6):138-143.

Keywords : petroleum hydrocarbons, reproduction, estuarine, acute, survival, feeding, chronic, heating oil, copepod, Ofour, salt water, marine invertebrate, aromatic, rate

[ Exposure of an estuarine copepod to the water-soluble fraction (1 ppm) of an 'aromatic heating oil' for 0.25 to 72 hrs in acute exposures and then to 10 or 50 ppb for 10 da in a longer-term exposure. Measured survival, feeding rate, reproduction, and life span.]

**Berge, J. A.** 1990. Macrofauna recolonization of subtidal sediments. Experimental studies on defaunated sediment contaminated with crude oil in two Norwegian fjords with unequal eutrophication status. I. Community responses. *Mar. Ecol. Prog. Ser.* **66**( ):103-115.

Keywords : macrofauna, sediment, crude oil, community, North Sea crude oil, benthic, species, diversity, biomass, evenness, Ofour, salt water, marine invertebrate, eutrophication, oiled, North Sea

[ Placed boxes of defaunated, oiled or unoiled, sediment on the seafloor of a eutrophicated and a non-eutrophicated fjord. North Sea crude oil was used to contaminate the sediment. Measure colonization response by benthic macrofauna (no. of species, individuals, evenness, diversity, biomass).]

**Bergman, R. D., R. L. Howard, K. F. Abraham, and M. W. Weller.** 1977. Water birds and their wetland resources in relation to oil development at Storkersen Point, Alaska. Anonymous. Resource Publication 129, pp.1-38. U.S. Fish & Wildlife Service. Washington, DC.

Keywords : bird, habitat, oilfield, fresh water, Oone, Alaska, North Slope, development

[ Assessment of breeding birds and their habitat needs prior to oil development on the North Slope of Alaska.]

**Berman, M. S. and D. R. Heinle.** 1980. Modification of the feeding behavior of marine copepods by sub-lethal concentrations of water-accomodated fuel oil. *Mar. Biol.* **56**( ):59-64.

Keywords : feeding, behavior, copepod, sublethal, fuel oil, No.2 fuel oil, Ofour, salt water, marine invertebrate, species, concentration

[ Exposed two species of marine copepods to low concentrations (70-250 ppb) of water-accomodated No. 2 fuel oil for 18 h. Measured feeding behavior.]

**Bernard, D., H. Pascaline, and J.-J. Jeremie.** 1996. Distribution and origin of hydrocarbons in sediments from lagoons with fringing mangrove communities. *Marine Pollut. Bull.* **32**(10):734-739.

Keywords : origin, hydrocarbons, sediment, aromatic, discharges, saturated hydrocarbons, concentration, salt water, Oten, miscellaneous, Caribbean, urban

[ Assessment of aromatic and non-aromatic hydrocarbons in the sediments of two lagoons on the Caribbean island of Guadeloupe; one lagoon receives river drainage from an agricultural area and the

other receives discharges and runoff from industry, urban areas, and shipping.]

**Bhosle, N. B. and A. Row.** 1983. Effect of dispersants on the growth of indigenous bacterial population & biodegradation of crude oil. *Indian J. Mar. Sci.* **12**():194-196.

Keywords : dispersant, growth, biodegradation, crude oil, combination, bacteria, Saudi Arabian crude oil, ODFour, salt water, marine invertebrate, Arabian crude oil, numbers

[ Seven oil dispersants, alone or in combination with Saudi Arabian crude oil, were evaluated for their effect on the growth of indigenous bacteria. Measured bacteria numbers and the loss of dispersant and oil from experimental flasks

[interpretation of results with regard to biodegradation of crude oil are unclear].]

**Bibby, C. J.** 1981. An experiment on the recovery of dead birds from the North Sea. *Ornis Scandinavica* **12**(3):261-265.

Keywords : recovery, bird, North Sea, salt water, Oone, drift, experiment

[ Results of a dead bird recovery experiment in the North Sea.]

**Bickham, J. W., J. A. Mazet, J. Blake, M. J. Smolen, Y. Lou, and E. Ballachey.** 1998. Flow cytometric determination of genotoxic effects of exposure to petroleum in mink and sea otters. *Ecotoxicology* **7**(4):191-199.

Keywords : genotoxic, sea otter, experiment, female, weathered, Prudhoe Bay crude oil, crude oil, diet, kidney, liver, tissue, Bunker C, fuel oil, spleen, blood, Prince William Sound, spill, Otwo, salt water, fresh water, mammal

[ Flow cytometric assessment of the effects of petroleum exposure in mink and sea otters. In one experiment, female mink were fed weathered Prudhoe Bay crude oil in the diet for 3 wks prior to mating, during pregnancy, and through weaning. Kits were exposed through lactation and by diet until 4 mo old. Kidney and liver tissue examined. In the second experiment, female mink were exposed either by diet or externally to crude oil or bunker C fuel oil. Spleen and kidney tissue examined. Also, blood was collected from sea otters from the eastern and western portions of Prince William Sound 1.5 yrs after the oil spill. Measured genome size (DNA) and coefficient of variation of the G<sub>1</sub> peak.]

**Bigford, T. E.** 1977. Effects of oil on behavioral responses to light, pressure and gravity in larvae of the rock crab *Cancer irroratus*. *Mar. Biol.* **43**():137-148.

Keywords : light, larvae, crab, development, concentration, fuel oil, behavior, No.2 fuel oil, pressure, gravity, Ofour, salt water, marine invertebrate, static, condition, water

[ Larvae of the rock crab at six stages of development were exposed to three concentrations of the water-accomodated fraction of No. 2 fuel oil under static conditions. Also included various conditions of light, pressure, and gravity. Water column behaviors of the larvae were measured.]

**Birkhead, T. R., C. Lloyd, and P. Corkhill.** 1973. Oiled seabirds successfully cleaning their plumage. *British Birds* **66**():535-537.

Keywords : oiled, cleaning, plumage, reproduction, salt water, Oone, bird

[ Report of the successful cleaning of oiled plumage and subsequent successful breeding.]

**Bitton, G., D. A. Chuckran, I. Chet, and R. Mitchell.** 1979. Resistance of bacterial chemotaxis to blockage in petroleum waters. *Mar. Pollut. Bull.* **10**(2):48-49.

Keywords : bacteria, concentration, kerosene, fresh water, salt water, chemotaxis, Ofour, marine invertebrate, water

[ Exposure of marine bacteria to various concentrations of kerosene in water. Comparison of chemotaxis of kerosene-degrading bacteria with that of bacteria not capable of decomposing kerosene. Used both sea water and fresh water.]

**Blake, B. F.** 1983. A comparative study of the diet of auks killed during an oil incident in the Skagerrak in January 1981. *J. Zool. Lond.* **201**(1):12

Keywords : auks, spill, Denmark, diet, salt water, Oone, bird, relation, oiling

[ Diets of seabirds killed in an oil spill in the Skagerrak, north of Denmark, and their relation to the amount of oiling.]

**Blaylock, W. M. and J. P. Houghton.** 1989. Infaunal recovery at Ediz Hook following the *Arco Anchorage* oil spill. Anonymous. 1989 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.421-426. Am. Petroleum Institute. Washington, D.C.

Keywords : recovery, spill, crude oil, Washington, benthic, infauna, season, Ofour, salt water, marine invertebrate

[ Assessment of the recovery of benthic infauna after a crude oil spill near Ediz Hook in Port Angeles, Washington. Five transects at four elevations, with respect to mean low tide, were sampled for benthic infauna during five sampling seasons over an 18 mo period.]

**Blokpoel, H. and R. M. G. Hamilton.** 1989. Effects of applying white mineral oil to chicken and gull eggs. *Wildl. Soc. Bull.* **17**():435-441.

Keywords : eggs, population, population control, chicken, gull, fresh water, Oone, bird, development, mineral oil

[ Development of an egg-oiling technique using mineral oil for controlling gull populations.]

**Blundo, R.** 1978. The toxic effects of the water soluble fractions of No. 2 fuel oil and of three aromatic hydrocarbons on the behavior and survival of barnacle larvae. *Contributions Mar. Sci.* **21**():25-37.

Keywords : fuel oil, aromatic hydrocarbons, behavior, survival, barnacle, larvae, concentration, naphthalene, toluene, benzene, weathered, No.2 fuel oil, Ofour, salt water, marine invertebrate, water

[ Exposure of barnacle larvae to varying concentrations of the water-soluble fraction of No. 2 fuel oil, naphthalene, toluene, or benzene. Compared fresh stock solutions with slightly weathered solutions. Measured survival and water column behavior.]

**Bode, H., R. Ernst, and J. Arditti.** 1978. Biological effects of surfactants, III hydra as a highly sensitive assay animal. *Environ. Pollut.* **17**(3):175-185.

Keywords : surfactant, concentration, survival, budding, hydra, nonionic, amphoteric, anionic, ODfive, fresh water, freshwater invertebrate, rate

[ Exposure of hydra to varying concentrations of homologous series of surfactants within three classes of surfactants (nonionic, amphoteric, anionic); measured budding rate and survival.]

**Boehm, P. D., G. S. Douglas, W. A. Burns, P. J. Mankiewicz, D. S. Page, and A. E. Bence.**

1997. Application of petroleum hydrocarbon chemical fingerprinting and allocation techniques after the *Exxon Valdez* oil spill. *Mar. Pollut. Bull.* **34**(8):599-613.

Keywords : petroleum hydrocarbons, fingerprinting, Exxon Valdez, spill, review, methods, development, model, research, Online, technical, salt water, petroleum, hydrocarbons

[ Review and assessment of the status of petroleum hydrocarbon fingerprinting methods. Authors present a historical summary, fingerprinting during the Exxon Valdez oil spill, advances in analytical techniques and data interpretation, development of a mixing model algorithm, development of a fingerprinting strategy for oil spills, and current research in fingerprinting of petroleum.]

**Boehm, P. D., P. J. Mankiewicz, R. Hartung, J. M. Neff, D. S. Page, E. S. Gilfillan, E.**

**O'Reilly, and K. R. Parker.** 1996. Characterization of mussel beds with residual oil and the risk to foraging wildlife 4 years after the *Exxon Valdez* oil spill. *Environ. Toxicol. Chem.* **15**(8):1289-1303.

Keywords : Exxon Valdez, spill, mussel, sea otter, aromatic hydrocarbons, sediment, salt water, Prince William Sound, Alaska, Oone, mammal, bird, crude oil, risk, oiled, estimate, hazard

[ Risk assessment of mussels in Prince William Sound 4 years after the Exxon Valdez oil spill. Mussel beds in upper, middle, and lower tidal zones of 64 randomly selected sites in oiled and reference sites were sampled for PAH analysis. Mussel beds were also characterized to compare with similar information collected in 1990. Findings were compared with 1990 results to estimate the hazard to birds and sea otters from consuming oiled mussels.]

**Boehm, P. D., D. S. Page, E. S. Gilfillan, A. E. Bence, W. A. Burns, and P. J. Mankiewicz.**

1998. Study of the fates and effects of the *Exxon Valdez* oil spill on benthic sediments in two bays in Prince William Sound, Alaska. 1. Study design, chemistry, and source fingerprinting. *Environ. Sci. Technol.* **32**(5):567-576.

Keywords : Exxon Valdez, spill, sediment, Prince William Sound, Alaska, fingerprinting, subtidal, North Slope crude oil, oil seep, crude oil, aromatic hydrocarbons, salt water, Oten, miscellaneous, water, North Slope

[ Comparison of the PAHs in subtidal sediments of two bays on Knight Island, Prince William Sound, Alaska; one bay affected by the Alaska oil spill and the other not affected. Sampled sediments at water depths ranging from 10 to 150 m and analyzed for Alaska North Slope PAHs, natural oil-seep PAHs, pyrogenic PAHs, and biogenic/diagenic PAHs.]

**Boehm, P. D. and J. G. Quinn.** 1977. The persistence of chronically accumulated hydrocarbons in the hard shell clam *Mercenaria mercenaria*. *Mar. Biol.* **44**():227-233.

Keywords : hydrocarbons, clam, depuration, concentration, chronic, Ofour, salt water, marine invertebrate, rate, shell

[ Assessment of the depuration rate for hard shell clams from the chronically polluted Providence River, RI; measured total hydrocarbon concentration at intervals during a 120 da depuration period.]

**Boersma, P. D.** 1986. Ingestion of petroleum by seabirds can serve as a monitor of water quality. *Science* **231**(4736):373-376.

Keywords : ingestion, storm-petrel, alkane, Prudhoe Bay crude oil, monitoring, salt water, Oone, bird, long-term

[ Promotion of the use of storm-petrels as monitors of low-level long-term oil pollution on the open seas.]

**Boersma, P. D.** 1987. Penguins oiled in Argentina. *Science* **236**(4798):135

Keywords : penguin, oiled, Argentina, salt water, Oone, bird, oiling, coast

[ Report of serious oiling of penguins on the coast of Argentina.]

**Boersma, P. D., E. M. Davies, and W. V. Reid.** 1988. Weathered crude oil effects on chicks of fork-tailed storm-petrels (*Oceanodroma furcata*). *Arch. Environ. Contam. Toxicol.* **17**(4):527-531.

Keywords : weathered, crude oil, storm-petrel, Prudhoe Bay crude oil, chicks, growth, development, dosed, salt water, Oone, bird, Prudhoe Bay

[ Young fork-tailed storm-petrels dosed with weathered Prudhoe Bay crude oil were evaluated for effects on growth and development.]

**Bonsdorff, E., T. Bakke, and A. Pedersen.** 1990. Colonization of amphipods and polychaetes to sediments experimentally exposed to oil hydrocarbons. *Mar. Pollut. Bull.* **21**(7):355-358.

Keywords : polychaete, sediment, Ekofisk crude oil, crude oil, experiment, amphipod, Ofour, salt water, marine invertebrate, density, invertebrate

[ Effects of water-soluble fractions of Ekofisk crude oil in sediments on colonization by amphipods and polychaetes; two oil treatments during a 6-mo field experiment. Measured density of invertebrates.]

**Borowsky, B., P. Aitken-Ander, and J. T. Tanacredi.** 1993. The effects of low doses of waste crankcase oil on *Melita nitida* Smith (Crustacea: Amphipoda). *J. Exp. Mar. Biol. Ecol.* **166**(1):39-46.

Keywords : crankcase oil, amphipod, sediment, survival, juvenile, reproduction, Ofour, salt water, marine invertebrate, female

[ Exposure of adult amphipods to 1, 10, or 100 ppm waste crankcase oil mixed in sediment. Measured survival of adults and juveniles and reproduction of adult females.]

**Botello, A. V., S. F. Villanueva, G. G. Diaz, and E. Escobar-Briones.** 1998. Polycyclic aromatic hydrocarbons in sediments from Salina Cruz Harbor and coastal areas, Oaxaca, Mexico. *Mar. Pollut. Bull.* **36**(7):554-558.

Keywords : aromatic hydrocarbons, sediment, Mexico, concentration, organic, carbon, coast, harbour, Oten, salt water, miscellaneous, aromatic, hydrocarbons

[ Determination of concentrations of total PAHs and organic carbon in sediments of Salina Cruz Harbour and nearby coast areas.]

**Boucher, G.** 1980. Impact of *Amoco Cadiz* oil spill on intertidal and sublittoral meiofauna. *Mar.*

Pollut. Bull. **11**(4):95-101.

Keywords : Amoco Cadiz, spill, intertidal, copepod, oiled, numbers, species, diversity, density, crude oil, nematode, Ofour, salt water, marine invertebrate, sublittoral

[ Assessment of the intertidal and sublittoral nematodes and copepods in sand substrate heavily oiled by the Amoco Cadiz oil spill. Measured densities, number of species, and diversity indices over a 7-mo period following the spill.]

**Boucher, G.** 1985. Long term monitoring of meiofauna densities after the *Amoco Cadiz* oil spill. Mar. Pollut. Bull. **16**(8):328-333.

Keywords : long-term, monitoring, density, Amoco Cadiz, spill, copepod, nematode, estuarine, invertebrate, crude oil, sublittoral, Ofour, salt water, marine invertebrate

[ Assesment of the long-term effect of pollution from the Amoco Cadiz oil spill on copepods and nematodes in a sublittoral and an estuarine site. Measured densities of invertebrates monthly during a 1-year prepill period and for 4 years after the spill.]

**Bourne, W. R. P.** 1968. Oil pollution and bird populations. Anonymous. The biological effects of oil pollution on littoral communities, pp.99-121. Vol. Suppl. 2. Edition Field Studies.

Keywords : bird, population, history, region, salt water, Oone

[ A historical and contemporary assessment of the effects of oil pollution on bird populations.]

**Bourne, W. R. P.** 1978. *Amoco Cadiz* seems likely to exterminate the French auks. Marine Pollut. Bull. **9**(6):145

Keywords : auks, spill, France, population, salt water, Oone, Amoco Cadiz, bird

[ Comment on the likelihood of extermination of French auks because of the Amoco Cadiz oil spill.]

**Bourne, W. R. P.** 1979. The *Christos Bitas* affair. Marine Pollut. Bull. **10**(5):122-123.

Keywords : spill, crude oil, bird, mammal, seals, salt water, Oone, England, coast, Wales

[ Effects of the Christos Bitas spill of crude oil on birds and seals off the coast of Wales.]

**Bourne, W. R. P. and C. J. Bibby.** 1975. Temperature and the seasonal and geographical occurrence of oiled birds on west European beaches. Marine Pollut. Bull. **6**(5):77-80.

Keywords : oiled, bird, temperature, season, salt water, Oone, Europe, beach

[ Comparison of occurrence of oiled birds with the season; west European beaches.]

**Bourne, W. R. P. and L. Johnston.** 1971. The threat of oil pollution to north Scottish seabird colonies. Marine Pollut. Bull. **2**(8):117-119.

Keywords : spill, Scotland, salt water, Oone, bird

[ Report and assessment of an oil spill in the north Scottish islands.]

**Bowman, R. E. and R. W. Langton.** 1978. Fish predation on oil-contaminated prey from the region of the *Argo Merchant* oil spill. Anonymous. In the Wake of the Argo Merchant, pp.137-141. University of Rhode Island.

Keywords : fish, squid, spill, Bunker C, fuel oil, species, food chain, Othree, salt water, transfer, Argo

Merchant, marine invertebrate

[ An assessment of the movement of spilled Bunker C fuel oil (Argo Merchant) from prey species to predator species; field collections of fish and squid.]

**Bowman, T. D., P. F. Schempf, and J. A. Bernatowicz.** 1995. Bald eagle survival and population dynamics in Alaska after the *Exxon Valdez* oil spill. *J. Wildl. Manage.* **59**(2):317-324.

Keywords : population, Alaska, Exxon Valdez, spill, recovery, Prince William Sound, survival, bald eagle, salt water, Oone, bird

[ Survival and population recovery for bald eagles in the Prince William Sound area following the Exxon Valdez oil spill.]

**Bowman, T. D., P. F. Schempf, and J. I. Hodges.** 1997. Bald eagle population in Prince William Sound after the *Exxon Valdez* oil spill. *J. Wildl. Manage.* **61**(3):962-967.

Keywords : bald eagle, population, Prince William Sound, Exxon Valdez, spill, survey, crude oil, bird, census, Oone, salt water

[ Survey of the bald eagle population of Prince William Sound in an effort to determine the effect of the Exxon Valdez oil spill; census conducted in 1982 (partial), 1989-91, and 1995.]

**Bowyer, R. T., J. W. Testa, and J. B. Faro.** 1995. Habitat selection and home ranges of river otters in a marine environment: effects of the Exxon Valdez oil spill. *J. Mammalogy* **76**(1):1-11.

Keywords : habitat, Exxon Valdez, spill, river otter, Prince William Sound, Prudhoe Bay crude oil, crude oil, Alaska, salt water, mammal, Otwo

[ Effects of Exxon Valdez oil spill on habitat selection and use by sea otters in Prince William Sound.]

**Bowyer, R. T., J. W. Testa, J. B. Faro, C. C. Schwartz, and J. B. Browning.** 1994. Changes in diets of river otters in Prince William Sound, Alaska: effects of the *Exxon Valdez* oil spill. *Can. J. Zool.* **72**(9):970-976.

Keywords : diet, Prince William Sound, Alaska, Exxon Valdez, spill, Prudhoe Bay crude oil, crude oil, mammal, river otter, feces, Otwo, salt water

[ Effects of the Exxon Valdez oil spill on diet of river otters in Prince William Sound.]

**Braddock, J. F., J. E. Lindstrom, and E. J. Brown.** 1995. Distribution of hydrocarbon-degrading microorganisms in sediments from Prince William Sound, Alaska, following the *Exxon Valdez* oil spill. *Mar. Pollut. Bull.* **30**(2):125-132.

Keywords : distribution, sediment, Prince William Sound, Alaska, Exxon Valdez, spill, density, intertidal, subtidal, microbes, crude oil, Ofour, salt water, marine invertebrate

[ Measurement of density of hydrocarbon-degrading microorganisms in intertidal and subtidal (depths varying from 3 to 100 m) sediments of Prince William Sound. Six sampling cruises conducted from summer of 1989 to summer of 1991. Densities and temporal changes in densities compared to distribution of oil from the Exxon Valdez spill.]

**Braddock, J. F., M. L. Ruth, P. H. Catterall, J. L. Walworth, and K. A. McCarthy.** 1997.

Enhancement and inhibition of microbial activity in hydrocarbon-contaminated Arctic soils: implications



for nutrient-amended bioremediation. Environ. Sci. Technol. **31**(7):2078-2084.

Keywords : Arctic, soil, bioremediation, nutrients, jet fuel, Oten, microbes, miscellaneous

[ Evaluation of nutrient supplementation (N, P) on the bioremediation of an Alaskan site contaminated with jet fuel; three levels of supplementation, laboratory microcosms, on-site mesocosms.]

**Bradshaw, C. J. A., S. Boutin, and D. M. Hebert.** 1997. Effects of petroleum exploration on woodland caribou in northeastern Alberta. J. Wildl. Manage. **61**(4):1127-1133.

Keywords : activity, behavior, time, habitat, oilfield, development, Alberta, Canada, caribou, mammal, Otwa, petroleum

[ Evaluation of the effects of simulated petroleum exploration activities on the movement and behavior of caribou during the winter. Caribou in Alberta exposed to noises adjusted for volume and duration to simulated specific stages in the exploration for oil. Measured time devoted to movement and the use of habitat patches.]

**Bradshaw, C. J. A., S. Boutin, and D. M. Hebert.** 1998. Energetic implications of disturbance caused by petroleum exploration to woodland caribou. Can. J. Zool. **76**(7):1319-1324.

Keywords : energetics, petroleum, caribou, female, Alberta, development, weight, Otwa, mammal

[ Estimation of the energetic costs to female woodland caribou of disturbance caused by petroleum exploration during the winter in northeast Alberta. Derived estimates of encounter rates and subsequent energy expenditure for nine separate regions. Energy expenditure estimates were then converted to loss of body mass.]

**Brauner, C. J., C. L. Ballantyne, M. M. Vijayan, and A. L. Val.** 1999. Crude oil exposure affects air-breathing frequency, blood phosphate levels and ion regulation in an air-breathing teleost fish, *Hoplosternum littorale*. Comp. Biochem. Physiol. C **123**(2):127-134.

Keywords : crude oil, Urucu crude oil, air-breathing, blood, phosphate, fish, dosed, plasma, concentration, ion regulation, Othree, fresh water

[ Determination of the effects on an air-breathing fish of exposure to a crude oil. Fish were sequentially exposed to 12.5, 25, 37.5, and 50% water-soluble fraction (WSF) of Urucu crude oil in one experiment. In a second experiment, fish were dosed with crude oil in amounts of 0.3, 1.0, or 3.0 ml/kg body mass for one assessment and in the amount of 3.0 ml/kg in a second assessment. Measured air breathing frequency and blood parameters in fish exposed to WSF. Measured K<sup>+</sup> and NA<sup>+</sup> fluxes in blood plasma at 24, 48, and 72 hrs post dosing, K<sup>+</sup> over a 24-hr period post dosing, and blood phosphate concentrations over a 24-hr period post dosing.]

**Bregnard, T. P.-A., P. Hohener, and J. Zeyer.** 1998. Bioavailability and biodegradation of weathered diesel fuel in aquifer material under denitrifying conditions. Environ. Toxicol. Chem. **17**(7):1222-1229.

Keywords : biodegradation, weathered, diesel fuel, surfactant, microbes, Oten, fresh water, miscellaneous, condition

[ Experimental efforts to enhance biodegradation of weathered diesel fuel in an aquifer by indigenous microorganisms under denitrifying conditions. Tested agitation of aquifer, addition of a biosurfactant

and a synthetic surfactant, and addition of solvent-extracted weathered diesel fuel.]

**Briggs, K. T., M. E. Gershwin, and D. W. Anderson.** 1997. Consequences of petrochemical ingestion and stress on the immune system of seabirds. *ICES J. Mar. Sci.* **54**():718-725.

Keywords : ingestion, stress, review, commentary, bird, capture, cleaning, rehabilitation, research, immune response, salt water, Oone, petroleum

[ Review and commentary of the effects on the immune system of birds of petroleum ingestion and related stresses associated with oil exposure, environmental disturbance by people, capture, and cleaning. Recommendations for seabird rehabilitation procedures and needed research.]

**Brodersen, C. C., S. D. Rice, J. W. Short, T. A. Mecklenburg, and J. F. Karinen.** 1977.

Sensitivity of larval and adult Alaskan shrimp and crabs to acute exposures of the water-soluble fraction of Cook Inlet crude oil. Anonymous. Proceedings, 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.575-578. American Petroleum Institute. Washington, DC.

Keywords : shrimp, crab, Cook Inlet crude oil, crude oil, species, Alaska, concentration, larvae, survival, Ofour, salt water, marine invertebrate, spill, behavior, juvenile, static

[ Exposure of larval and adult shrimp of several species and juvenile king crabs (Alaska) to varying concentrations of the water-soluble fraction of Cook Inlet crude oil. Used a 96 hr static test to calculate LC50s.]

**Brody, A. J., K. Ralls, and D. B. Siniff.** 1996. Potential impact of oil spills on California sea otters: implications of the *Exxon Valdez* spill in Alaska. *Marine Mammal Sci.* **12**(1):38-53.

Keywords : spill, California, sea otter, Exxon Valdez, Alaska, time, risk, model, distance, salt water, Otwo, mammal, estimate

[ Estimate of the risk to California sea otters calculated with models of distance from spill site and time since spill; Exxon Valdez spill information on sea otters used as reference data for the models.]

**Brown, J. L., J. Syslo, L. Yi-Hua, S. Getty, R. Vemuri, and R. Nadeau.** 1998. On-site treatment of contaminated soils: an approach to bioremediation of weathered petroleum compounds. *J. Soil Contam.* **7**(6):773-800.

Keywords : soil, bioremediation, weathered, petroleum, refinery, degradation, combination, petroleum hydrocarbons, nitrogen, Oten, miscellaneous

[ A bench-scale investigation of the options for bioremediation of a large quantity of petroleum-contaminated soil from an old refinery site. Compared degradation over a 110 da period for soil mixed with combinations of high- or low-nitrogen compost and organic or nonorganic bulking agents. Measured petroleum hydrocarbons at beginning and at 2-wk intervals.]

**Brown, R. P., A. Cristini, and K. R. Cooper.** 1992. Histopathological alterations in *Mya arenaria* following a #2 Fuel Oil spill in the Arthur Kill, Elizabeth, New Jersey. *Mar. Environ. Res.* **34**(1-4):65-68.

Keywords : fuel oil, spill, New Jersey, tissue, clam, No.2 fuel oil, pathology, Ofour, salt water, marine invertebrate

[ Documentation of the effects of a large No. 2 fuel oil spill on the soft tissue of the clam *Mya arenaria*.

Clams were sampled 1 wk after the spill and at monthly intervals for 1 yr; soft tissue examined for tissue lesions.]

**Buck, W. F. A. and J. Harrison.** 1967. Some prolonged effects of oil pollution on the Medway Estuary. Anonymous. Wildfowler's Assn. of Gr.Britain and Ireland Yearbook, pp.32-33. Edition 1967 Yearbook. Wildfowler's Assn. of Gr.Britian and Ireland.

Keywords : estuary, bird, spill, crude oil, population, habitat, salt water, Oone

[ An account of the immediate effect (death) and prolonged effects (decreased bird use) of the spill of crude oil into the Medway Estuary.]

**Bue, B. G., S. Sharr, S. D. Moffitt, and A. K. Craig.** 1996. Effects of the *Exxon Valdez* oil spill on pink salmon embryos and preemergent fry. Anonymous. American Fisheries Society Symposium, pp.619-627. Am.Fish.Soc.

Keywords : Exxon Valdez, spill, pink salmon, embryo, fry, stream, survival, crude oil, Othree, fresh water, fish, fishery, society, salmon

[ Evaluated the effects of the Exxon Valdez oil spill on survival of pink salmon embryos and preemergent fry in streams during the fall of 1989-92. Most of the work performed on 10 oil-contaminated and 15 reference streams. Measured survival of embryos and survival of embryo to preemergent fry.]

**Bue, B. G., S. Sharr, and J. E. Seeb.** 1998. Evidence of damage to pink salmon populations inhabiting Prince William Sound, Alaska, two generations after the *Exxon Valdez* oil spill. Trans. Am. Fish. Soc. **127**():35-43.

Keywords : pink salmon, population, Alaska, Exxon Valdez, spill, survival, embryo, stream, eggs, sperm, Othree, fresh water, fish, salmon, condition

[ Extension of the Bue et.al. (1996) study. Survival of embryos measured in 10 oil-contaminated and 15 reference streams in 1993-95. Collected eggs and sperm from mature salmon in oil-contaminated and reference streams and performed intrastream crosses under laboratory conditions.]

**Bugbee, S. L. and C. M. Walter.** 1973. The response of macroinvertebrates to gasoline pollution in a mountain stream. Anonymous. Prevention and Control of Oil Spills, pp.725-731. American Petroleum Institute. Washington, DC.

Keywords : stream, spill, fish, aviation gasoline, invertebrate, community, Ofive, fresh water, freshwater invertebrate, gasoline

[ Report of a spill of aviation gasoline into a stream in South Dakota; losses of fish and aquatic vertebrates were documented.]

**Burger, A. E.** 1992. The effects of oil pollution on seabirds off the west coast of Vancouver Island. Vermeer K, Butler RW, and Morgan KH (eds.), Occasional Paper, Canadian Wildlife Service, pp.120-128. Canadian Wildl.Serv.

Keywords : spill, history, Vancouver Island, salt water, bird, population, Oone, coast

[ A general assessment of the historical and potential effects of oil spills on seabirds of the west coast of Vancouver Island.]

**Burger, A. E.** 1993. Estimating the mortality of seabirds following oil spills: effects of spill volume. *Marine Pollut. Bull.* **26**(3):140-143.

Keywords : spill, bird, spill size, prediction, salt water, Oone, relation

[ Assessment of the relation between spill volume and mortality of seabirds.]

**Burger, A. E.** 1993. Mortality of seabirds assessed from beached-bird surveys in southern British Columbia. *Canadian Field-Naturalist* **107**(2):164-176.

Keywords : beached bird survey, British Columbia, salt water, Oone, spill, bird, survey

[ Report on 5 years of beached-bird surveys in British Columbia.]

**Burger, A. E. and D. M. Fry.** 1993. Effects of oil pollution on seabirds in the northeast Pacific. Vermeer K, Briggs KT, Morgan KH, and Siegel-Causey D (eds.), Special Publication, Canadian Wildl.Serv. pp.254-263. Canadian Wildl.Serv. Ottawa, Canada.

Keywords : spill, Pacific, salt water, methods, rehabilitation, Oone, bird

[ General assessment of the effects of oil pollution on seabirds in the northeast Pacific, especially during the period 1974-89.]

**Burger, J., J. Brzorad, and M. Gochfeld.** 1991. Immediate effects of an oil spill on behavior of fiddler crabs (*Uca pugnax*). *Arch. Environ. Contam. Toxicol.* **20**(3):404-409.

Keywords : spill, behavior, crab, fuel oil, No.2 fuel oil, Ofour, salt water, marine invertebrate, oiled

[ Assessment of the effects of a spill of No. 2 fuel oil on the behavior of fiddler crabs. Crabs collected from oiled areas on three dates within 35 da of the spill and compared to two groups of controls. Measured righting response, movement, and defensive behavior.]

**Burger, J., J. Brzorad, and M. Gochfeld.** 1992. Effects of an oil spill on emergence and mortality in fiddler crabs *Uca pugnax*. *Environ. Monitor. Assess.* **22**(2):107-115.

Keywords : spill, emergence, crab, fuel oil, survival, salt marsh, No.2 fuel oil, creek, Ofour, salt water, marine invertebrate

[ Assessment of the effects of a No. 2 fuel oil spill on emergence and subsequent survival of fiddler crabs *Uca pugnax*. Thirty salt marsh creeks located adjacent, near, and distant from the spill were surveyed over a 2 mo period.]

**Burger, J. and M. Gochfeld.** 1992. Effects of washing fiddler crabs (*Uca pugnax*) following an oil spill. *Environ. Pollut.* **77**(1):15-22.

Keywords : crab, spill, fuel oil, behavior, No.2 fuel oil, washing, Ofour, salt water, marine invertebrate

[ Assessment of the effects of a No. 2 fuel oil spill on the behavior of fiddler crabs *Uca pugnax*. Washed and unwashed fiddler crabs were compared with regard to righting behavior, movement, and aggressive behavior; evaluated temporal aspect by also measuring behavior 2 and 4 da after washing.]

**Burger, J. and N. Tsipoura.** 1998. Experimental oiling of sanderlings (*Calidris alba*): behavior and weight changes. *Environ. Toxicol. Chem.* **17**(6):1154-1158.

Keywords : oiling, behavior, weight, crude oil, feathers, plumage, bird, Oone, salt water, shorebird

[ Applied crude oil to the belly feathers of sanderlings to simulate 20% plumage oiling. Measured weight change, change in size of oil patch, and change in behavior during a 35 da post-oiling period.]

**Burns, K. A.** 1976. Hydrocarbon metabolism in the intertidal fiddler crab *Uca pugnax*. Mar. Biol. **36**():5-11.

Keywords : petroleum hydrocarbons, metabolism, crab, concentration, Ofour, salt water, marine invertebrate, hydrocarbons

[ Comparison of hydrocarbon metabolism and hydrocarbon content between fiddler crabs from an uncontaminated and a previously contaminated marsh; in vivo and in vitro measurements of metabolism.]

**Burns, K. A., M. G. Ehrhardt, B. L. Howes, and C. D. Taylor.** 1993. Subtidal benthic community respiration and production near the heavily oiled Gulf Coast of Saudi Arabia. Mar. Pollut. Bull. **27**():199-205.

Keywords : benthic, community, respiration, oiled, light, hydrocarbons, sediment, Gulf oil spill, Ofour, salt water, marine invertebrate

[ Assessment of the effects of oil from the Gulf War on subtidal benthic respiration and production. Used benthic respirometers to measure DO flux in light and dark chambers. Also measured hydrocarbon content of sediments.]

**Burns, K. A. and A. H. Knap.** 1989. The Bahia las Minas oil spill. Hydrocarbon uptake by reef building corals. Mar. Pollut. Bull. **20**(8):391-398.

Keywords : spill, uptake, coral, crude oil, Caribbean, sediment, Panama, water, Ofour, salt water, marine invertebrate, storage, petroleum

[ Assessment of the presence of crude oil 5 mos after the rupture of a storage tank near the Caribbean entrance of the Panama Canal (Bahia las Minas spill). Measured petroleum in corals, sediments, and seawater.]

**Burns, K. A. and J. M. Teal.** 1971. Hydrocarbon incorporation into the salt marsh ecosystem from the West Falmouth oil spill. Anonymous. Technical Report, pp.1-24. Tech.Rep. 71-69. Woods Hole Oceanographic Institute. Woods Hole, MA.

Keywords : hydrocarbons, spill, sediment, No.2 fuel oil, degradation, Massachussetts, salt water, Oone, algae, mussel, bird, fish, marine plant, Florida, fuel oil

[ Analyses of sediments and organisms collected one year later from the site of the barge "Florida" spill of No. 2 fuel oil near West Falmouth, MA.]

**Burns, K. A. and J. M. Teal.** 1979. The West Falmouth oil spill: hydrocarbons in the salt marsh ecosystem. Estuarine & Coastal Marine Sci. **8**(4):349-360.

Keywords : spill, hydrocarbons, salt marsh, sediment, No.2 fuel oil, salt water, agae, marine plant, crustacean, bird, fish, uptake, degradation, Oone, fuel oil

[ Analyses of sediments and organisms from the West Falmouth No. 2 fuel oil spill collected from 1 to 7

years after the spill.]

**Burns, K. A. and L. Yelle-Simmons.** 1994. The Galeta oil spill. IV. Relationship between sediment and organism hydrocarbon loads. *Estuarine Coastal Shelf Sci.* **38**(4):397-412.

Keywords : spill, sediment, saturated, unsaturated, petroleum hydrocarbons, Caribbean, Panama, mussel, oyster, crude oil, Ofour, salt water, marine invertebrate, petroleum, hydrocarbons

[ Assessment of the presence of saturated and unsaturated petroleum hydrocarbons from the 1986 Bahia las Minas oil spill near the Caribbean entrance of the Panama Canal. Measure petroleum in sediment, false mussels, and oysters over a 5-yr period.]

**Busdosh, M.** 1981. Long-term effects of the water soluble fraction of Prudhoe Bay crude oil on survival, movement and food search success of the Arctic amphipod *Boeckosimus* (= *Onisimus*) *affinis*. *Mar. Environ. Res.* **5**(3):167-180.

Keywords : long-term, Prudhoe Bay crude oil, crude oil, survival, food, Arctic, amphipod, concentration, behavior, Ofour, salt water, marine invertebrate, Prudhoe Bay

[ Exposure of an Arctic amphipod to varying concentrations of the water-soluble fraction of Prudhoe Bay crude oil. Exposed for either 16 wks at constant concentration, one-time exposure for 3 da, or one-time exposure for 10 da. Measured survival and behavior.]

**Bushdosh, M. and R. M. Atlas.** 1977. Toxicity of oil slicks to Arctic amphipods. *Arctic* **30**(2):85-92.

Keywords : oil slick, Arctic, amphipod, diesel fuel, aliphatic, aromatic, Prudhoe Bay crude oil, crude oil, survival, salt water, Ofour, marine invertebrate, species, Prudhoe Bay, respiration, water, rate

[ Exposure of two species of Arctic amphipods to diesel fuel or one of three components (aliphatic, aromatic, or asphaltic) of Prudhoe Bay crude oil for 25 da. Laboratory exposure and outdoor exposure in brackish water ponds. Half of the amphipod trays in laboratory exposure were shielded from the surface oil by a screen. Measured survival and respiration rates.]

**Butler, J. N., P. G. Wells, S. Johnson, and J. J. Manock.** 1998. Beach tar on Bermuda: recent observations and implications for global monitoring. *Mar. Pollut. Bull.* **36**(6):458-463.

Keywords : beach, monitoring, intertidal, distribution, quantity, survey, tar ball, Oten, salt water, miscellaneous, methods

[ Intertidal beach tar sampled on a Bermuda beach with a transect sampling method. Described distribution, appearance, and quantity of tar lumps and related the results to previous beach tar surveys performed on Bermuda beaches.]

**Butler, R. G., A. Harfenist, F. A. Leighton, and D. B. Peakall.** 1988. Impact of sublethal oil and emulsion exposure on the reproductive success of Leach's storm-petrels: short and long-term effects. *J. Appl. Ecol.* **25**(1):125-143.

Keywords : storm-petrel, Prudhoe Bay crude oil, crude oil, Corexit 9527, bird, salt water, reproduction, Oone, long-term, Prudhoe Bay

[ The short- and long-term reproductive effects on Leach's storm-petrels of exposure to Prudhoe Bay

Crude oil or dispersed (Corexit 9527) crude oil during a 3-year field study.]

**Butler, R. G. and P. Lukasiewicz.** 1979. A field study of the effect of crude oil on herring gull (*Larus argentatus*) chick growth. Auk **96**(4):809-812.

Keywords : crude oil, gull, chicks, growth, dosed, development, South Louisiana crude oil, salt water, Oone, Maine, bird, herring, herring gull, Louisiana

[ Growth of herring gull chicks dosed with South Louisiana crude oil.]

**Butler, R. G., D. B. Peakall, F. A. Leighton, J. Borthwick, and R. S. Harmon.** 1986. Effects of crude oil exposure on standard metabolic rate of Leach's storm-petrel. The Condor **88**(2):248-249.

Keywords : crude oil, storm-petrel, plumage, experiment, ingestion, Prudhoe Bay crude oil, metabolism, Oone, salt water, bird, Prudhoe Bay, rate

[ Effects of ingested Prudhoe Bay crude oil and oil applied to plumage on the metabolic rate of Leach's storm-petrel; two experiments.]

**Butler, R. G., W. Trivelpiece, D. Miller, P. Bishop, C. D'Amico, M. D'Amico, G. Lambert, and D. Peakall.** 1979. Further studies of the effects of petroleum hydrocarbons on marine birds. Bull. Mount Desert Island Biol. Lab. **19**():33-35.

Keywords : hydrocarbons, aromatic, bird, gull, storm-petrel, chicks, dosed, weathered, salt water, dispersant, growth, ODone, herring, herring gull, Prudhoe Bay, Louisiana, organ, weight

[ Herring gull and Leach's storm-petrel chicks dosed with Prudhoe Bay crude, weathered South Louisiana crude, an aromatic fraction of PBC, dispersant, or an oil/dispersant mixture. Chick growth and organ weights monitored.]

**Butler, R. G., W. Trivelpiece, and D. S. Miller.** 1982. The effects of oil, dispersant, and emulsions on the survival and behavior of an estuarine teleost and an intertidal amphipod. Environ. Res. **27**(2):266-276.

Keywords : dispersant, survival, behavior, fish, marine invertebrate, fuel oil, No.2 fuel oil, salt water, ODthree, emulsion, amphipod

[ Experimental assessment of the effects of No. 2 fuel oil, AP chemical dispersant, or an emulsion of the two on the survival and behavior of a killifish and an amphipod.]

**Byrne, C.** 1989. Effects of the water-soluble fractions of No. 2 fuel oil on the cytokinesis of the quahog clam (*Mercenaria mercenaria*). Bull. Environ. Contam. Toxicol. **42**(1):81-86.

Keywords : fuel oil, clam, eggs, development, embryo, No.2 fuel oil, salt water, Ofour, marine invertebrate

[ Exposure of eggs of the quahog clam to water-soluble fraction of No. 2 fuel oil. Measured development at early stages of embryo formation.]

**Cabioch, L.** 1980. Pollution of subtidal sediments and disturbance of benthic animal communities. Ambio **9**(6):294-296.

Keywords : subtidal, sediment, benthic, community, recovery, invertebrate, oiled, coast, France,

Amoco Cadiz, crude oil, salt water, Ofour, marine invertebrate, spill

[ Description of the effects on and subsequent recovery of subtidal benthic invertebrates in heavily oiled portions of the coast of France near the site of the Amoco Cadiz oil spill. Covers the first year after the spill.]

**Cadbury, C. J.** 1978. The beach bird survey and other seabird surveillance. *Ibis* **120**(1):119-120.

Keywords : bird, spill, England, salt water, Oone, beached bird survey, beach, survey, relation

[ The British beach bird survey and it's relation to oil spill assessment.]

**Cairns, D. K. and R. D. Elliot.** 1987. Oil spill impact assessment for seabirds: the role of refugia and growth centres. *Biol. Conserv.* **40**(1):1-9.

Keywords : spill, salt water, population, marine birds, bird, recovery, Oone, Newfoundland

[ Assessment of the role of refugia to serve as population sources in cases of oil spill impacts on marine bird colonies.]

**Cajaraville, M. P., J. A. Marigomez, and E. Angulo.** 1991. Automated measurement of lysosomal structure alterations in oocytes of mussels exposed to petroleum hydrocarbons. *Arch. Environ. Contam. Toxicol.* **21**(3):395-400.

Keywords : mussel, crude oil, physiology, lubricating oil, pathology, gonads, Ofour, salt water, marine invertebrate, species

[ Exposure of one species of mussel to the water-accomodated fraction of two crude oils (Ural and Maya) or a commercial lubricant oil for 21 da. Measured effects on the lysosomal system of mature oocytes; physiology and histopathology.]

**Cajaraville, M. P., J. A. Marigomez, and E. Angulo.** 1992. Comparative effects of the water accommodated fraction of three oils on mussels -- 1. Survival, growth and gonad development. *Comp. Biochem. Physiol.* **102C**(1):103-112.

Keywords : mussel, survival, growth, gonads, development, crude oil, lubricating oil, abnormalities, spawning, pathology, shell, Ofour, salt water, marine invertebrate, species, tissue

[ Exposed one species of mussel to the water-accomodated fraction of two crude oils (Maya and Ural) or a commerical lubricating oil for 91 da. Measured survival, flesh and shell growth, shell abnormalities, spawning, and histopathological changes in gonad tissue.]

**Cajaraville, M. P., J. A. Marigomez, G. Diez, and E. Angulo.** 1992. Comparative effects of the water accommodated fraction of three oils on mussels -- 2. Quantitative alterations in the structure of the digestive tubules. *Comp. Biochem. Physiol.* **102C**(1):113-123.

Keywords : mussel, digestive gland, crude oil, lubricating oil, Ofour, salt water, marine invertebrate, water, structure

[ Exposure of mussels for 91 da to the water accommodated fraction of Ural and Maya crude oils and a lubricant oil. Measured several aspects of digestive gland structure.]

**Cajaraville, M. P., A. Orbea, I. Marigomez, and I. Cancio.** 1997. Peroxisome proliferation in the digestive epithelium of mussels exposed to the water accommodated fraction of three oils. *Comp.*



Biochem. Physiol. **117C**(3):233-242.

Keywords : mussel, concentration, crude oil, biomarker, time, biochemical, physiology, marine invertebrate, salt water, bivalve, Ofour, water, petroleum

[ Assessment of the induction of peroxisomes in the digestive epithelium of mussels as a result of exposure to three concentrations of water accommodated fraction of two crude oils for 21, 49, and 91 da. Purpose was to determine if peroxisome proliferation could be used as a diagnostic biomarker for petroleum exposure.]

**Calder, J. A. and J. H. Lader.** 1976. Effect of dissolved aromatic hydrocarbons on the growth of marine bacteria in batch culture. Appl. Environ. Microbiol. **32**(1):95-101.

Keywords : aromatic hydrocarbons, growth, bacteria, density, Ofour, salt water, marine invertebrate, species, saturated, water, aromatic, hydrocarbons, rate, cell

[ Exposure of two species of marine bacteria to saturated water solutions of seven aromatic hydrocarbons for up to 30 hrs. Measured growth rate and maximum cell density of bacteria in cell cultures.]

**Caldwell, C. A.** 1997. Aromatic hydrocarbon pathology in fish following a large spill into the Nemadji River, Wisconsin, USA. Bull. Environ. Contam. Toxicol. **58**(4):574-581.

Keywords : aromatic hydrocarbons, fish, fresh water, stream, spill, pathology, tissue, Othree, aromatic, hydrocarbons

[ Tissue damage to fish following a spill of aromatic hydrocarbons into a Wisconsin river.]

**Caldwell, P. J. and A. E. Snart.** 1974. A photographic index for aging mallard embryos. J. Wildl. Manage. **38**(2):298-301.

Keywords : index, mallard, photographic, embryo, Oone, bird

[]

**Calfee, R. D., E. E. Little, L. Cleveland, and M. G. Barron.** 1999. Photoenhanced toxicity of a weathered oil on *Ceriodaphnia dubia* reproduction. Environ. Sci. Pollut. Res. **6**(4):207-212.

Keywords : toxicity, weathered, reproduction, crude oil, zooplankton, concentration, light, static, survival, adult, Ofive, fresh water, freshwater invertebrate

[ Assessment of the toxicity of a weathered crude oil, in the presence of simulated solar radiation, to reproduction in a zooplankton species. Six concentrations of the water-accommodated fraction of the crude oil were combined with three levels of UV and visible light in 7-da static renewal laboratory tests. Measured survival and offspring per adult on a daily basis.]

**Cameron, J. A. and R. L. Smith.** 1980. Ultrastructural effects of crude oil on early life stages of Pacific herring. Anonymous. Transactions of the American Fisheries Society, pp.224-228. American Fisheries Society.

Keywords : crude oil, herring, eggs, Prudhoe Bay crude oil, larvae, fish, abnormalities, pathology, Othree, salt water, Pacific, Pacific herring, Prudhoe Bay

[ Effects on eggs of the Pacific herring experimentally exposed to Prudhoe Bay crude oil; gross abnormalities and electron microscopy of newly hatched larvae.]

**Campbell, L. H., K. T. Standring, and C. J. Cadbury.** 1978. Firth of Forth oil pollution incident, February 1978. *Marine Pollut. Bull.* **9**(3):335-339.

Keywords : wintering, spill, fuel oil, salt water, Oone, bird, England, waterfowl

[ Description of effects on wintering waterfowl of a small spill of medium/heavy fuel oil.]

**Camphuysen, C. J.** 1998. Beached bird surveys indicate decline in chronic oil pollution in the North Sea. *Mar. Pollut. Bull.* **36**(7):519-526.

Keywords : beached bird survey, bird, survey, chronic, North Sea, coast, Netherlands, vulnerability, oiling, rate, index, Oone, salt water

[ Analysis of 21 yrs of beached bird surveys along the coast of the Netherlands. Use of oil vulnerability indices, oiling rates, and counts of corpses.]

**Canevari, G. P. and G. P. Lindblom.** 1976. Some dissenting remarks on 'Deleterious effects of Corexit 9527 on fertilization and development'. *Marine Pollut. Bull.* **7**(7):127-128.

Keywords : Corexit 9527, fertilization, development, eggs, marine invertebrate, ODFour, salt water, dispersant, sea urchin

[ Some rebuttal statements concerning a report of the effects of Corexit 9527 on sea urchin eggs by Lonning and Hagstrom (1976).]

**Cantelmo, A., L. Mantel, R. Lazell, F. Hospod, E. Flynn, S. Goldberg, and M. Katz.** 1982. The effects of benzene and dimethylnaphthalene on physiological processes in juveniles of the blue crab, Callinectes sapidus. W. B. Vernberg, A. Calabrese, F. P. Thurberg, and F. J. Vernberg (eds.), *Physiological mechanisms of marine pollutant toxicity*, pp.349-389. Academic Press, New York.

Keywords : benzene, juvenile, blue crab, toxicity, weight, oxygen, tissue, dimethylnaphthalene, physiology, growth, biochemical, Ofour, salt water, marine invertebrate, crab, time, activity

[ Exposure of juvenile blue crabs to either 1 ppm dissolved benzene or 0.01 ppm dissolved dimethylnaphthalene until they died or molted. Measured time to molt, limb regeneration, weight and width at molt, oxygen consumption of whole animals and tissues, constituents of hemolymph, and ATPase activity.]

**Capuzzo, J. M. and B. A. Lancaster.** 1982. Physiological effects of petroleum hydrocarbons in larval lobsters (Homarus americanus): hydrocarbon accumulation and interference with lipid metabolism. W. B. Vernberg, A. Calabrese, F. P. Thurberg, and F. J. Vernberg (eds.), *Physiological mechanisms of marine pollutant toxicity*, pp.477-501. Academic Press, Inc. New York.

Keywords : lobster, South Louisiana crude oil, crude oil, Corexit 9527, diet, petroleum hydrocarbons, tissue, survival, ammonium, moulting, respiration, ODFour, salt water, marine invertebrate, dispersant, petroleum, hydrocarbons, accumulation, metabolism, Louisiana, water, rate, ratio

[ Larval American lobsters were exposed for 96 hr to the water-soluble fractions of South Louisiana crude oil (250 ppb), crude oil-dispersant (Corexit 9527; 250 ppb:25 ppb), or a diet of Artemia sp. nauplii that were hatched in 250 ppb crude oil. Measured hydrocarbon content of water and tissues of larval lobsters, survival, moulting rates, ammonia excretion rates, and O:N ratios.]

**Caris, M. G., G. D. Marty, T. R. Meyers, R. E. Thomas, and S. D. Rice.** 1998. Expression of viral hemorrhagic septicemia virus in prespawning Pacific herring (*Clupea pallasii*) exposed to weathered crude oil. Can. J. Fish. Aquat. Sci. **55**(10):2300-2309.

Keywords : Pacific herring, herring, weathered, crude oil, adult, gravel, oiled, concentration, flow-through, bioassay, survival, virus, pathology, monooxygenase, Othree, salt water, fish, immune response, Pacific

[ Adult Pacific herring were exposed to gravel oiled with varying concentrations of "weathered" crude oil (control, trace, low, mid, high) (initial aqueous concentrations ranged from 0.03 to 58.3 ppb). Exposure lasted for 16-18 da in a laboratory flow-through bioassay. Measured total and specific PAH concentrations, herring survival, prevalence of viral hemorrhagic septicemia virus, MFO response, and micro- and macroscopic pathological responses.]

**Carls, M. G. and S. D. Rice.** 1989. Abnormal development and growth reductions of pollock *Theragra chalcogramma* embryos exposed to water-soluble fractions of oil. Fishery Bull. **88**(1):29-37.

Keywords : development, growth, embryo, crude oil, survival, Cook Inlet crude oil, fish, Othree, salt water, pollock

[ Effects of water-soluble fractions of Cook Inlet crude oil on embryos of pollock; survival, growth, and development.]

**Carls, M. G., S. D. Rice, and J. E. Hose.** 1999. Sensitivity of fish embryos to weathered crude oil: part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval Pacific herring (*Clupea pallasii*). Environ. Toxicol. Chem. **18**(3):481-493.

Keywords : fish, embryo, weathered, crude oil, incubation, malformation, Pacific, Pacific herring, herring, eggs, concentration, North Slope crude oil, aromatic hydrocarbons, hatching, swimming, larvae, abnormalities, salt water, Othree

[ Eggs of the Pacific herring were exposed for up to 16 d to four concentrations of weathered Alaskan North Slope crude oil. Two types of weathered oil used. Measured selective and total PAH concentrations in water, hatching success, hatching timing, swimming ability of larvae, and larval abnormalities.]

**Carmen, E. P., T. L. Crossman, and E. G. Gatliff.** 1998. Phytoremediation of No. 2 fuel oil-contaminated soil. J. Soil Contam. **7**(4):455-466.

Keywords : soil, No.2 fuel oil, fuel oil, plant, growth, petroleum hydrocarbons, water, remediation, Oseven, fresh water, freshwater plant

[ Description of a phytoremediation effort at an industrial site containing 'hot spots' of soil heavily contaminated with No. 2 fuel oil. Soil was biovented for 24 wks and tested for suitability for plant growth. Willow trees were planted to bioremediate the remaining fuel oil hydrocarbons in the subsurface water.]

**Carr, R. S., M. E. Barrows, N. G. Reichenbach, G. M. DeGraeve, T. L. Pollock, J. A. Fava, and A. H. Glickman.** 1990. Investigation of preference-avoidance responses to an oil refinery effluent with striped bass and steelhead trout. Environ. Toxicol. Chem. **9**(1-3):1513-1521.

Keywords : refinery, striped bass, steelhead trout, fish, behavior, avoidance, Othree, salt water, effluent, juvenile

[ Assessment of the behavioral response of juvenile striped bass and steelhead trout exposed to refinery effluent discharged into San Francisco Bay.]

**Carr, R. S. and O. Linden.** 1984. Bioenergetic responses of *Gammarus salinus* and *Mytilus edulis* to oil and oil dispersants in a model ecosystem. Mar. Ecol. -Prog. Ser. **19**():285-291.

Keywords : dispersant, mussel, amphipod, Ekofisk crude oil, crude oil, respiration, ammonium, reproduction, biochemical, ODFour, salt water, marine invertebrate, water, ratio

[ Exposure of a mussel and an amphipod to a mixture of oil (Ekofisk crude oil) and water or oil+dispersant (Corexit 9550) and water for 12 da. Measured oil in water; O:N ratio, respiration, and ammonia excretion for amphipods; and byassal thread production and percent spawned for mussels.]

**Cavanaugh, K. P.** 1982. The effects of South Louisiana and Kuwait crude oils on reproduction. Scanes CG, Ottinger MA, Kenny AD, Balthazart J, Cronshaw J, and Jones IC (eds.), Graduate Studies Texas Tech University. Aspects of Avian Endocrinology: Practical and Theoretical Implications, pp.371-377. Edition Edition 26. Texas Tech Press. Lubbock, Texas.

Keywords : South Louisiana crude oil, Kuwait crude oil, crude oil, reproduction, mallard, duck, eggs, hormone, concentration, eggshell, Oone, bird, fresh water, Texas, Louisiana, Kuwait

[ Discussion of the results of multiple studies of the reproductive effects of ingested South Louisiana and Kuwait crude oils on mallard ducks; egg production, eggshell thickness, hormone concentrations.]

**Cavanaugh, K. P., A. R. Goldsmith, W. N. Holmes, and B. K. Follett.** 1983. Effects of ingested petroleum on the plasma prolactin levels during incubation and on the breeding success of paired mallard ducks. Arch. Environ. Contam. Toxicol. **12**(3):335-341.

Keywords : incubation, mallard, South Louisiana crude oil, reproduction, prolactin, fresh water, Oone, bird, Louisiana, crude oil

[ Effects of ingested South Louisiana crude oil on mallard reproduction.]

**Cavanaugh, K. P. and W. N. Holmes.** 1982. Effects of ingested petroleum on plasma levels of ovarian steroid hormones in photostimulated mallard ducks. Arch. Environ. Contam. Toxicol. **11**(4):503-508.

Keywords : mallard, crude oil, reproduction, fresh water, hormone, Oone, bird, Louisiana

[ Effects of ingested South Louisiana crude oil on reproduction in mallards.]

**Cavanaugh, K. P. and W. N. Holmes.** 1987. Effects of ingested petroleum on the development of ovarian endocrine function in photostimulated mallard ducks (*Anas platyrhynchos*). Arch. Environ. Contam. Toxicol. **16**(2):247-253.

Keywords : development, mallard, South Louisiana crude oil, reproduction, endocrine, fresh water, Oone, bird, Louisiana, crude oil

[ Effects of ingested South Louisiana crude oil on mallard reproduction.]

**Celander, M., D. Broman, L. Forlin, and C. Naf.** 1995. Effects of petroleum hydrocarbons on the

hepatic cytochrome P450 1A1 system in rainbow trout. *Marine Environ. Res.* **39**():61-65.

Keywords : Othree, rainbow trout, fish, North Sea crude oil, crude oil, injection, metabolism, fresh water, kerosene, gas oil, light, North Sea, juvenile

[ Effects on the hepatic cytochrome P450 1A1 system of juvenile rainbow trout injected with kerosene, light gas oil, or heavy gas oil distilled from North Sea crude oil.]

**Celander, M., C. Naf, D. Broman, and L. Forlin.** 1994. Temporal aspects of induction of hepatic cytochrome P450 1A and conjugating enzymes in the viviparous blenny (*Zoarces viviparus*) treated with petroleum hydrocarbons. *Aquatic Toxicol.* **29**():183-196.

Keywords : Othree, injection, gas oil, crude oil, North Sea crude oil, salt water, blenny, metabolism, fish, enzyme

[ Effects on hepatic cytochrome P450 1A and other enzymes of the viviparous blenny following injection with the heavy gas oil fraction distilled from North Sea crude oil.]

**Chabreck, R. H.** 1973. Bird usage of marsh ponds subjected to oil spills. *Louisiana Acad. Sci.* **26**():101-110.

Keywords : bird, spill, crude oil, freshwater plant, sediment, water, invertebrate, fish, fresh water, Oone, recovery, Louisiana, plant, petroleum, concentration

[ Effects of a crude oil spill in three freshwater ponds in Louisiana over a 2-year period. Data on bird usage, plants, invertebrates, fish, and oil in sediments and water. The petroleum concentrations are suspect because they are so high.]

**Chaineau, C. H., J. L. Morel, and J. Oudot.** 1997. Phytotoxicity and plant uptake of fuel oil hydrocarbons. *J. Environ. Quality* **26**(6):1478-1483.

Keywords : plant, uptake, fuel oil, hydrocarbons, aromatic, aliphatic, soil, germination, growth, Oseven, freshwater plant, weight

[ The effects of a normal fuel oil and a fuel oil with lowered aromatic content were tested for phytotoxicity when incorporated into soil at 0.3 to 1.2 % by weight. Plants tested were sunflower, maize, wheat, barley, bean, lettuce, and clover. Measured effects on seed germination, plant growth, and plant uptake.]

**Chambers, J. E.** 1979. Induction of microsomal mixed-function oxidase system components in striped mullet by short-term exposure to crude oil. *Toxicol. Letters* **4**():227-230.

Keywords : mixed-function oxidase, crude oil, Othree, Empire Mix crude oil, Arabian crude oil, fish, striped mullet, salt water, metabolism, microsomal, juvenile, mullet, water

[ Effect on the hepatic microsomal mixed-function oxidase system of juvenile striped mullet following water exposure to Empire Mix crude oil or Arabian crude oil.]

**Chambers, J. E., J. R. Heitz, F. M. McCorkle, and J. D. Yarbrough.** 1978. The effects of crude oil on enzymes in the brown shrimp (*Penaeus* sp). *Comp. Biochem. Physiol.* **61C**():29-32.

Keywords : crude oil, enzyme, shrimp, Arabian crude oil, hepatopancreas, Ofour, salt water, marine invertebrate

[ Exposure of brown shrimp to 10 ppm emulsified Saudi Arabian crude oil for 24 hr. Measured

changes in 12 enzymes from the stomach-hepatopancreas.]

**Chambers, J. E., J. R. Heitz, F. M. McCorkle, and J. D. Yarbrough.** 1979. Enzyme activities following chronic exposure to crude oil in a simulated ecosystem. II. Striped mullet. *Environ. Res.* **20**(1):140-147.

Keywords : crude oil, striped mullet, liver, muscle, brain, Empire Mix crude oil, gill, enzyme, Othree, salt water, fish, tissue, mullet, estuarine, ecosystem

[ Effects on a set of enzymes from brain, gill, liver, and muscle tissue of striped mullet following exposure for 10 months to Empire Mix crude oil in a simulated estuarine ecosystem.]

**Chambers, J. E., J. R. Heitz, F. M. McCorkle, and J. D. Yarbrough.** 1979. Enzyme activities following chronic exposure to crude oil in a simulated ecosystem. *Environ. Res.* **20**(1):133-139.

Keywords : enzyme, chronic, crude oil, oyster, shrimp, Empire Mix crude oil, concentration, hepatopancreas, spill, Ofour, salt water, marine invertebrate, ecosystem, simulation, petroleum, activity

[ Exposure of oysters and shrimp in a simulated ecosystem to chronic petroleum contamination. Empire Mix crude oil was added to produce an initial concentration of 0.2 ppm. Whole oyster homogenates and hepatopancreas homogenates from shrimp were analyzed for enzyme activities at 6, 4, and 0.5 mos before oil exposure and 0.5, 1, 2, 4, and 6 mos after the simulated oil spill.]

**Chang, Z. Z. and R. W. Weaver.** 1997. Nitrification and utilization of ammonium and nitrate during oil bioremediation at different soil water potentials. *J. Soil Contam.* **6**(2):149-160.

Keywords : bioremediation, soil, water potential, crude oil, concentration, Arabian crude oil, fresh water, ammonium, nitrate, Oten, miscellaneous, water

[ Nitrification and utilization of ammonium and nitrate during a 40-day bioremediation study with Arabian crude oil and a clay loam soil; varying crude oil concentrations and soil water potentials.]

**Chaudhury, S., S. Khan, and A. D. Rahimtula.** 1988. Comparison of the inhibitory effects of some compounds present in crude oils on rat platelet aggregation: role of intra- and extra-cellular calcium. *Toxicology* **51**():35-46.

Keywords : crude oil, hydrocarbons, nonhydrocarbon, platelet, physiology, rat, mammal, Otwo

[ Effects on rat platelet aggregation of several hydrocarbon and nonhydrocarbon compounds found in crude oil.]

**Chaudhury, S., S. Macko, and A. D. Rahimtula.** 1987. Inhibition of rat platelet aggregation by a Prudhoe Bay crude oil and its aliphatic, aromatic, and heterocyclic fractions. *Toxicol. Appl. Pharmacol.* **90**(2):347-356.

Keywords : rat, platelet, Prudhoe Bay crude oil, crude oil, aliphatic, aromatic, nonhydrocarbon, physiology, mammal, Otwo, Prudhoe Bay

[ Effects on rat platelet aggregation after dosing rats with Prudhoe Bay crude oil; also incubated platelets with DMSO, a DMSO extract of the crude oil, aliphatic fraction, aromatic fraction, or nonhydrocarbon fraction.]

**Chaudhury, S., M. Martin, J. F. Payne, and A. Rahimtula.** 1987. Alterations in platelet aggregation and microsomal benzo-"-pyrene hydroxylase activities after exposure of rats to a Prudhoe Bay crude oil. *J. Biochem. Toxicol.* **2**():93-104.

Keywords : platelet, rat, Prudhoe Bay crude oil, crude oil, microsomal, mammal, physiology, Otwo, activity, Prudhoe Bay

[ Effects on rat platelet aggregation and microsomal benzo-"-pyrene hydroxylase activity after dosing rats with Prudhoe Bay crude oil.]

**Chet, I. and R. Mitchell.** 1976. Petroleum hydrocarbons inhibit decomposition of organic matter in seawater. *Nature* **261**(5558):308-309.

Keywords : petroleum hydrocarbons, organic, bacteria, kerosene, decomposition, Ofour, salt water, marine invertebrate, rate

[ Effects on motility and chemotactic response of motile bacteria of exposure to 3 mg/ml (parts per thousand) kerosene. Measured rate of decomposition of organic matter in seawater.]

**Cho, B., H. Chino, H. Tsuji, T. Kunito, K. Nagaoka, S. Otsuka, K. Yamashita, S. Matsumoto, and H. Oyaizu.** 1998. Laboratory-scale bioremediation of oil-contaminated soil of Kuwait with soil amendment materials. *Chemosphere* **35**(7):1599-1611.

Keywords : bioremediation, soil, Kuwait, degradation, methods, surfactant, nutrients, spill, toxicity, petroleum hydrocarbons, Oten, miscellaneous, oiled, petroleum, hydrocarbons

[ Experimentation with degradation methods for the oil-contaminated soils of Kuwait. Four kinds of materials and eight kinds of surfactants were added to oiled soils, in addition to the nutrient materials, hyponex and bark manure. Measured amount of petroleum degradation and toxicity of the degraded hydrocarbons in the soil (Ames test).]

**Choules, G. L., W. C. Russell, and D. A. Gauthier.** 1978. Duck mortality from detergent-polluted water. *J. Wildl. Manage.* **42**(2):410-414.

Keywords : waterfowl, experiment, mallard, cleaning, oiled, bird, detergent, Oone, fresh water, water

[ Investigation of the recurring deaths of waterfowl on an industrial waste basin at the Rocky Mountain Arsenal, Denver. Experiments were performed with mallards being exposed externally and internally to water containing detergents. Results related to the cleaning of oiled birds.]

**Christens, E. and H. Blokpoel.** 1991. Operational spraying of white mineral oil to prevent hatching of gull eggs. *Wildl. Soc. Bull.* **19**(4):423-430.

Keywords : gull, eggs, embryo, herring gull, ring-billed gull, fresh water, mineral oil, spray, Canada, Oone, population control, bird, herring

[ Operational use of mineral oil spray to kill embryos of herring and ring-billed gulls.]

**Christens, E., H. Blokpoel, G. Rason, and S. W. D. Jarvie.** 1995. Spraying white mineral oil on Canada goose eggs to prevent hatching. *Wildl. Soc. Bull.* **23**(2):228-230.

Keywords : mineral oil, Canada, eggs, bird, Canada geese, hatching, population control, fresh water, Oone

[ Operational spraying of Canada goose eggs to prevent hatching.]

**Christiansen, M. E. and F. C. Stormer.** 1978. Effects of the water-soluble fraction of Ekofisk crude oil on zoeal larvae of the crab *Hyas araneus*. *Ambio* **7**(1):23-25.

Keywords : Ekofisk crude oil, crude oil, larvae, crab, survival, moult, Ofour, salt water, marine invertebrate

[ Exposure of larvae of a brachyuran crab to 0.3, 1.5, and 3.0 ppm of the water-soluble fraction of Ekofisk crude oil for 75 da. Measured survival and molt response.]

**Clark, R. B.** 1978. Oiled seabird rescue and conservation. *J. Fish. Res. Board of Canada* **35**(5):675-678.

Keywords : oiled, bird, rehabilitation, population, salt water, Oone

[ Discussion of the usefulness of oiled bird rehabilitation as practiced in the late 70s.]

**Clark, R. B.** 1984. Impact of oil pollution on seabirds. *Environ. Pollut. (series A)* **33**(1):1-22.

Keywords : auks, spill, population, history, Atlantic, salt water, Oone, bird, decline

[ Discusses impact of oil pollution on seabirds of the Atlantic. Declines in southern auk colonies and increases in auk colonies of the northeast Atlantic are thought to be independent of oil spills. Concludes that oil spills are not generally damaging to seabird populations.]

**Clark, R. B., G. Dunnet, and J. M. Addy.** 1984. Seabirds and North Sea oil. *Marine Pollut. Bull.* **15**(7):272-274.

Keywords : North Sea, bird, salt water, research, Oone

[ Results of a seminar on seabirds and the North Sea oil industry; problems and research recommendations.]

**Clark, W. S. and E. Gorney.** 1987. Oil contamination of raptors migrating along the Red Sea. *Environ. Pollut.* **46**(4):307-313.

Keywords : raptor, salt water, spill, Red Sea, Oone, bird

[ Report of oil on migrating raptors going through Israel.]

**Clement, L. E., M. S. Stekoll, and D. G. Shaw.** 1980. Accumulation, fractionation and release of oil by the intertidal clam *Macoma balthica*. *Mar. Biol.* **57**(1):41-50.

Keywords : accumulation, clam, Prudhoe Bay crude oil, crude oil, depuration, tissue, petroleum hydrocarbons, Ofour, salt water, marine invertebrate, Prudhoe Bay

[ Exposure of the clam *Macoma balthica* to oil and seawater dispersions of 0.03, 0.3, or 3.0 ppm Prudhoe Bay crude oil for 180 da followed by a 60 da depuration period. Measured accumulation and depuration of various fractions of the crude oil in clam tissue.]

**Clifton, H. E., K. A. Kvenvolden, and J. B. Rapp.** 1984. Spilled oil and infaunal activity -- modification of burrowing behavior and redistribution of oil. *Mar. Environ. Res.* **11**(1):111-136.

Keywords : behavior, burrowing, North Slope crude oil, crude oil, Washington, persistence, aliphatic, infauna, tidal flat, Ofour, salt water, marine invertebrate, North Slope, activity, coast, experiment,



petroleum, composition, hydrocarbons

[ Assessment of the effects of North Slope crude oil on the infaunal activity in a tidal flat on the coast of Washington. Crude oil spilled over the surface of the flat in one experiment; a layer of oil-saturated sand 1 cm thick buried 5 cm beneath the surface in another experiment. Measured burrowing activity and petroleum persistence for up to 2 yrs. Petroleum composition monitored by analyzing for aliphatic hydrocarbons.]

**Cobb, J. L. S.** 1976. Seabird mortality. *Bird Study* **23**(4):299-300.

Keywords : bird, spill, fishing, nets, nineteenth century, salt water, Oone, England, commentary

[ Commentary on the magnitude of seabird deaths due to fishermen of the nineteenth century.

Comparisons made with the contemporary loss of birds due to oil spills.]

**Coffin, R. B., L. A. Cifuentes, and P. H. Pritchard.** 1997. Assimilation of oil-derived carbon and remedial nitrogen applications by intertidal food chains on a contaminated beach in Prince William Sound, Alaska. *Marine Environ. Res.* **44**(1):27-39.

Keywords : nitrogen, intertidal, food chain, Prince William Sound, Alaska, degradation, fertilizer, bacteria, oiled, experiment, algae, bivalve, Oten, salt water, marine invertebrate, carbon, isotope, miscellaneous, ratio, beach

[ Stable  $^{13}\text{C}$  and  $^{15}\text{N}$  ratios were used to evaluate oil degradation and the use of fertilizer supplements by bacteria on oiled beaches in the rocky intertidal zone of an island in Prince William Sound and in microcosm experiments. Isotope ratios were measured in bacterial substrate, algae, and bivalve grazers of algae and bacteria.]

**Cohen, Y., A. Nissenbaum, and R. Eisler.** 1977. Effects of Iranian crude oil on the Red Sea octocoral *Heteroxenia fuscescens*. *Environ. Pollut.* **12**(3):173-186.

Keywords : crude oil, Red Sea, coral, toxicity, concentration, survival, behavior, aliphatic, Iranian crude oil, Ofour, salt water, marine invertebrate, static, flow-through, hydrocarbons

[ Experimental exposure of a Red Sea coral to Iranian crude oil in static and flow-through toxicity tests. Static tests used concentrations of 1, 3, 10, or 30 ml/liter for 96 hr exposure. Flow-through tests used 10 ml/liter for 168 hr followed by a post-treatment period of 168 hr. Measured survival, behavior, and aliphatic hydrocarbon content of the coral.]

**Collier, T. K., M. M. Krahn, and D. C. Malins.** 1980. The disposition of naphthalene and its metabolites in the brain of rainbow trout (*Salmo gairdneri*). *Environ. Res.* **23**(1):35-41.

Keywords : naphthalene, brain, rainbow trout, liver, blood, injection, oral administration, metabolism, Othree, fresh water, fish, metabolite

[ Disposition of naphthalene and its metabolites in the brain, liver, and blood of rainbow trout following exposure by oral administration or injection.]

**Colwell, R. R. and J. D. Walker.** 1977. Ecological aspects of microbial degradation of petroleum in the marine environment. *Critical Rev. Microbiol.* **5**():423-445.

Keywords : degradation, petroleum, review, hydrocarbons, nonhydrocarbon, condition, rate, aliphatic, aromatic, Ofour, salt water, marine invertebrate, microbes, marine environment

[ Review of the process of microbial degradation of petroleum in the marine environment. Discusses degradation of various classes of hydrocarbons and non-hydrocarbons and environmental conditions that affect rates of degradation.]

**Conklin, P. J. and K. R. Rao.** 1984. Comparative toxicity of offshore and oil-added drilling muds to larvae of the grass shrimp *Palaemonetes intermedius*. Arch. Environ. Contam. Toxicol. **13**(6):685-690.

Keywords : toxicity, drilling mud, larvae, grass shrimp, shrimp, mineral oil, diesel fuel, survival, Ofour, salt water, marine invertebrate

[ Exposure of larvae of the grass shrimp to 11 offshore drilling muds, diesel oil, mineral oil, and eight diesel- and mineral oil-spiked drilling muds. Exposed for 96 hr and calculated 96 hr LC<sub>50s</sub>.]

**Connell, D. W., K. Cox, and R. L. McLauchlan.** 1975. Occurrence of kerosene-like hydrocarbons in the bream, *Mylio australis* Gunther. Australian J. Freshwater Res. **26**(3):419-422.

Keywords : hydrocarbons, Australia, kerosene, bream, fish, fresh water, Othree, taint

[ Report of a kerosene-like taint in bream collected in Australia; discussion of possible causes of the taint.]

**Connors, P. G. and S. Gelman.** 1980. Red phalarope responses to thin oil films in foraging experiments. Pacific Seabird Group ()17

Keywords : bird, spill, salt water, Oone, behavior, phalarope, experiment, oil slick, detection

[ Behavioural experiment with oil slick detection by red phalaropes.]

**Cook, C. B. and A. H. Knap.** 1983. Effects of crude oil and chemical dispersant on photosynthesis in the brain coral *Diploria strigosa*. Mar. Biol. **78**(1):21-27.

Keywords : crude oil, Arabian crude oil, dispersant, photosynthesis, coral, Corexit 9527, uptake, storage, ODFour, salt water, marine invertebrate, labelled, brain, light, water, combination, time, activity

[ Exposure of a brain coral to either Arabian Light crude oil mixed in water (19 ppm), Corexit 9527 dispersant (1 ppm), or a combination of crude oil and dispersant. Exposure time was 8 hr followed by a post-exposure period of 48 hr. Measured photosynthetic activity by means of <sup>14</sup>C uptake and identification of storage location of fixed C.]

**Coon, N. C., P. H. Albers, and R. C. Szaro.** 1979. No. 2 fuel oil decreases embryonic survival of great black-backed gulls. Bull. Environ. Contam. Toxicol. **21**():152-156.

Keywords : No.2 fuel oil, survival, gull, eggs, Maine, embryo, salt water, Oone, bird, fuel oil, great black-backed gull, age, oiling

[ Field study of the effects of No. 2 fuel oil applications to the eggs of great black-backed gulls on an island off the coast of Maine. Fuel oil applied in amounts of either 5 or 20  $\mu$ l. All eggs opened 8 da later. Measured survival and estimated age of embryo at time of egg oiling.]

**Coon, N. C. and M. P. Dieter.** 1981. Responses of adult mallard ducks to ingested South Louisiana crude oil. Environ. Res. **24**():309-314.

Keywords : mallard, South Louisiana crude oil, crude oil, fresh water, Oone, reproduction, physiology, ingestion, diet, bird, paraffin, survival, organ, weight, blood, tissue, pathology

[ Assessment of the effects on mallards of ingested crude oil. Adult mallard ducks were fed diets containing 0.25% or 2.5% South Louisiana crude oil, or 1% paraffin mixture for 26 wk. Measured survival, body and organ weights, reproduction, blood chemistry, and tissue pathology.]

**Cooper, K. R. and A. Cristini.** 1994. The effects of oil spills on bivalve mollusks and blue crabs. J. Burger (ed.), Before and After an Oil Spill: The Arthur Kill, pp.142-159. Rutgers Univ. Press, New Brunswick.

Keywords : spill, bivalve, blue crab, fuel oil, No.2 fuel oil, New Jersey, clam, pathology, Ofour, salt water, marine invertebrate, species, crab

[ Discussion of the effects of the 1990 Exxon spill of No. 2 fuel oil in the Arthur Kill of northeast New Jersey. Only presents data for lesions in one species of clam; crab data presented in other chapters. Much discussion of the literature.]

**Cormack, D.** 1984. Seabirds and oil. Marine Pollut. Bull. **15**(9):345-347.

Keywords : bird, numbers, index, spill, salt water, Oone, England, population, critique

[ Critique of the assumption that beached bird numbers provide a valid index of the loss of seabirds to oil spills.]

**Corner, E. D. S., R. P. Harris, C. C. Kilvington, and S. C. M. O'Hara.** 1976. Petroleum compounds in the marine food web: short-term experiments on the fate of naphthalene in *Calanus*. J. Mar. Biol. Assoc. **56**(1):121-133.

Keywords : food, water, experiment, fate, naphthalene, copepod, depuration, uptake, rate, metabolism, labelled, Ofour, salt water, marine invertebrate

[ Exposure of the copepod *Calanaus* to <sup>14</sup>C-labelled naphthalene in water for 24 hr followed by a depuration period of up to 10 da. Measured uptake from water or food containing <sup>14</sup>C-labelled naphthalene, rate of depuration, and amount of metabolism of the naphthalene by the copepod.]

**Costa, D. P. and G. L. Kooyman.** 1982. Oxygen consumption, thermoregulation, and the effect of fur oiling and washing on the sea otter, *Enhydra lutris*. Can. J. Zool. **60**(11):2761-2767.

Keywords : metabolism, sea otter, crude oil, Prudhoe Bay crude oil, insulation, fur, salt water, Otwo, mammal, oiling, Prudhoe Bay, washing, detergent

[ Effect on the insulating quality of sea otter fur after oiling with Prudhoe Bay crude oil or after oiling and washing with detergent.]

**Couillard, C. M. and F. A. Leighton.** 1989. Comparative pathology of Prudhoe Bay crude oil and inert shell sealants in chicken embryos. Fundamental & Appl. Toxicol. **13**(1):165-173.

Keywords : pathology, Prudhoe Bay crude oil, crude oil, chicken, embryo, fresh water, Oone, sealant, bird, oiling, Prudhoe Bay, shell, abnormalities, toxicity, air

[ Pathological investigation of the effects of oiling (Prudhoe Bay crude oil) versus inert shell sealants. Observed abnormalities confirmed the unique toxicity of crude oil compared to the effects of restricted air flow.]

**Couillard, C. M. and F. A. Leighton.** 1990. Sequential study of the pathology of Prudhoe Bay crude oil in chicken embryos. *Ecotoxicol. & Environ. Safety* **19**(1):17-23.

Keywords : bird, Prudhoe Bay crude oil, crude oil, chicken, embryo, fresh water, Oone, sequential, pathology, external, shell, Prudhoe Bay

[ Sequential pathology of chicken embryos exposed to external (shell) applications of Prudhoe Bay crude oil.]

**Couillard, C. M. and F. A. Leighton.** 1990. The toxicopathology of Prudhoe Bay crude oil in chicken embryos. *Fundamental & Appl. Toxicol.* **14**(1):30-39.

Keywords : Prudhoe Bay crude oil, crude oil, chicken, embryo, pathology, fresh water, Oone, bird, shell, Prudhoe Bay

[ Description of the pathology of chicken embryos exposed to externally applied (shell) Prudhoe Bay crude oil.]

**Couillard, C. M. and F. A. Leighton.** 1991. Bioassays for the toxicity of petroleum oils in chicken embryos. *Environ. Toxicol. Chem.* **10**(4):533-538.

Keywords : chicken, embryo, refined oil, eggs, crude oil, pathology, fresh water, Oone, bird

[ Toxic comparison of six crude and refined oils using chicken eggs.]

**Couillard, C. M. and F. A. Leighton.** 1991. Critical period of sensitivity to petroleum toxicity in the chicken embryo. *Environ. Toxicol. Chem.* **10**(2):249-253.

Keywords : chicken, embryo, crude oil, incubation, Prudhoe Bay crude oil, South Louisiana crude oil, fresh water, Oone, pathology, bird, shell

[ Identification of a large decrease in embryo sensitivity to shell crude oil application between days 8 and 9 of incubation.]

**Cowles, T. J.** 1983. Effects of exposure to sublethal concentrations of crude oil on the copepod *Centropages hamatus* II. Activity patterns. *Mar. Biol.* **78**(1):53-57.

Keywords : sublethal, concentration, crude oil, copepod, activity, South Louisiana crude oil, swimming, Ofour, salt water, marine invertebrate, Louisiana, flow-through

[ Exposure of a marine copepod to 80 ppb South Louisiana crude oil in a flow-through bioassay system for 64 hr. Measured activity patterns after 48-64 hr of exposure.]

**Cranford, P. J. and D. C. Gordon.** 1991. Chronic sublethal impact of mineral oil-based drilling mud cuttings on adult sea scallops. *Mar. Pollut. Bull.* **22**(7):339-344.

Keywords : chronic, sublethal, oil-based, drilling mud, survival, shell, tissue, growth, biochemical, composition, muscle, digestive gland, gonads, salt water, Ofour, marine invertebrate, hydrocarbons

[ Exposed adult sea scallops to mineral oil-based drilling muds from two wells for 59 da. Analyzed hydrocarbon content of drilling mud, determined survival of scallops, measured shell and tissue growth, and relative size and biochemical composition of the adductor muscle, digestive gland, gonad, and total soft tissue.]

**Crapp, G. B.** 1971. The ecological effects of stranded oil. E. B. Cowell (ed.), The ecological effects of oil pollution on littoral communities, pp.181-186. Applied Science Publishers, London.

Keywords : community, Kuwait crude oil, crude oil, weathered, survival, recovery, littoral, bivalve, salt water, Ofour, marine invertebrate, species, Kuwait, water, ratio, time

[ Exposure of seven species of littoral bivalves to immersion for 6 hrs in Kuwait crude oil or weathered Kuwait crude oil. Exposure of one species to immersion for 6 hrs in Kuwait crude oil or five refined products. Exposure of two species to immersion for 6 hrs to Kuwait crude oil after mixing with water (1:4 ratio) for up to 24 hrs. Measured survival and "recovery" times.]

**Cravedi, J. P. and J. Tulliez.** 1981. Distribution and elimination routes of a naphthenic hydrocarbon (dodecylcyclohexane) in rainbow trout (*Salmo gairdneri*). Bull. Environ. Contam. Toxicol. **26**(3):337-344.

Keywords : elimination, cycloalkane, rainbow trout, metabolism, ingestion, distribution, fish, fresh water, Othree

[ Metabolism, distribution, and elimination of a cycloalkane following ingestion by rainbow trout.]

**Crawford, R. B. and M. G. Muto.** 1977. Effects of water soluble fractions from crude oils on development of sand dollar embryos. Bull. Mt. Desert Is. Biol. Lab. **17**(1):112-115.

Keywords : development, embryo, fertilization, Kuwait crude oil, crude oil, South Louisiana crude oil, Bunker C, fuel oil, recovery, salt water, Ofour, marine invertebrate, water, Kuwait, Louisiana

[ Exposure of sand dollar embryos prior to fertilization or 9 min to 20 hrs after fertilization to 1, 10, 50, or 100% water soluble fraction of either Kuwait crude oil, South Louisiana crude oil, or Bunker C fuel oil. Also tested recovery of post-fertilization embryos after 1 hr of exposure.]

**Cripps, G. C. and J. Shears.** 1997. The fate in the marine environment of a minor diesel fuel spill from an Antarctic research station. Environ. Monitor. Assess. **46**(3):221-232.

Keywords : diesel fuel, spill, Antarctic, research, intertidal, tissue, concentration, aromatic, alkane, limpet, marine invertebrate, Ofour, salt water, toxicity, water

[ Report of the effects of a small spill of diesel fuel at an Antarctic research station; death of intertidal limpets, water and limpet tissue concentrations of aromatics and alkanes for up to 40 da post-spill.]

**Croce, B. and R. M. Stagg.** 1997. Exposure of Atlantic salmon parr (*Salmo salar*) to a combination of resin acids and a water soluble fraction of diesel fuel oil: a model to investigate the chemical causes of pigmented salmon syndrome. Environ. Toxicol. Chem. **16**(9):1921-1929.

Keywords : Atlantic salmon, fish, combination, Othree, diesel fuel, fuel oil, fresh water, concentration, blood, biochemistry, pigment, Atlantic, salmon, resin

[ Effects on Atlantic salmon parr of exposure (9 da) to the water-soluble fraction of diesel fuel and resin acids, separate and in combination; concentrations, blood characteristics, biochemistry.]

**Crocker, A. D., J. Cronshaw, and W. N. Holmes.** 1974. The effect of a crude oil on intestinal absorption in ducklings (*Anas platyrhynchos*). Environ. Pollut. **7**(1):165-177.

Keywords : crude oil, mallard, intestinal absorption, Oone, salt water, duckling, Santa Barbara crude oil, physiology, bird, water, duck, fresh water

[ Oral dosing of mallard ducklings with single doses of Santa Barbara crude oil inhibited the normal increase in intestinal absorption of water and Na<sup>+</sup> when ducks move from fresh water to salt water.]

**Crocker, A. D., J. Cronshaw, and W. N. Holmes.** 1975. The effect of several crude oils and some petroleum distillation fractions on intestinal absorption in ducklings (*Anas platyrhynchos*). Environ. Physiol. Biochem. **5**():92-106.

Keywords : crude oil, intestinal absorption, duckling, weathered, mallard, salt water, distillation fraction, Oone, physiology, bird, water

[ Single oral doses of eight crude oils and several distillate fractions and weathered samples of two of the crude oils were compared for their effects on mallard duckling ability to adjust to salt water (inhibited water and Na<sup>+</sup> absorption).]

**Cronshaw, J.** 1982. Introduction: pollutants and endocrine systems. Scanes CG, Ottinger MA, Kenny AD, Balthazart J, Cronshaw J, and Jones IC (eds.), Graduate Studies Texas Tech University. Aspects of Avian Endocrinology: Practical and Theoretical Implications, pp.351-357. Edition 26. Texas Tech Press. Lubbock, Texas.

Keywords : endocrine, hormone, gonads, adrenal, bird, fresh water, salt water, Oone, mallard, stress, Texas, petroleum

[ General introductory discussion of the effects of ingested petroleum on hormone production by gonads and adrenal glands in birds.]

**Cross, W. E., C. M. Martin, and D. H. Thomson.** 1987. Effects of experimental releases of oil and dispersed oil on Arctic nearshore macrobenthos. II. Epibenthos. Arctic **40**(Suppl. 1):201-210.

Keywords : Arctic, Corexit 9527, crude oil, weathered, Canada, density, population, structure, crustacean, abundance, echinoderm, dispersant, ODfour, salt water, marine invertebrate, species

[ Release of undispersed or chemically dispersed (Corexit 9527) Lagomedio crude oil (weathered) in two shallow bays on northern Baffin Island, Canada. Measured effects on epibenthos for two sampling periods before and four sampling periods after oil release during the years 1980-83. Sampled at 3 and 7 m depths. Measured species presence, density, and population structure of crustaceans, and abundance of echinoderms.]

**Cross, W. E. and D. H. Thomson.** 1987. Effects of experimental releases of oil and dispersed oil on Arctic nearshore macrobenthos. I. Infauna. Arctic **40**(Suppl. 1):184-200.

Keywords : Arctic, infauna, Corexit 9527, crude oil, weathered, Canada, distribution, community, structure, population, weight, bivalve, dispersant, ODfour, salt water, marine invertebrate, species, relation

[ Release of undispersed or chemically dispersed (Corexit 9527) Lagomedio crude oil (weathered) in two shallow bays on northern Baffin Island, Canada. Measured effects on infauna for two sampling periods before and four sampling periods after oil release during the years 1980-83. Sampled at 3 and 7 m depths. Measured distribution of species, community structure, population structure, and weight-length relations of bivalves.]

**Croxall, J. P.** 1975. The effect of oil on nature conservation, especially birds. H. A. Cole (ed.), Petroleum and the Continental Shelf of North-West Europe, pp.93-103. Vol. 2, Environmental Protection. Applied Science Publ., Inc.

Keywords : bird, Europe, spill, population, conservation, risk, rehabilitation, Oone, salt water, history

[ Assessment of the significance of oil spills to seabirds.]

**Culik, B. M., R. P. Wilson, A. T. Woakes, and F. W. Sanudo.** 1991. Oil pollution of Antarctic penguins: effects on energy metabolism and physiology. Marine Pollut. Bull. **22**(8):388-391.

Keywords : penguin, physiology, bird, Antarctic, salt water, Oone, metabolism, spill, oiling

[ Physiological effects of oiling on penguins tested in indoor and outdoor facilities; special emphasis on metabolism.]

**Curl, H. , Jr. and K. O'Donnell.** 1977. Chemical and physical properties of refined petroleum products. Anonymous. NOAA Technical Memorandum, ERL MESA-17. National Oceanic and Atmospheric Administration. Boulder, CO.

Keywords : petroleum products, refined oil, fuel oil, physical characteristics, chemical characteristics, Online, technical

[ Basic description of the physical and chemical characteristics of major classes of refined oil products.]

**Curtis, F. and J. Lammey.** 1998. Intrinsic remediation of a diesel fuel plume in Goose Bay, Labrador, Canada. Environ. Pollut. **103**(2-3):203-210.

Keywords : remediation, diesel fuel, Canada, Labrador, fuel oil, ground water, biodegradation, TPH, soil, fresh water, miscellaneous

[ A case study of the natural remediation of sub-surface fuel oil at Goose Bay, Labrador. A total of 102 groundwater and three surface water samples were collected to determine the extent of natural biodegradation of the hydrocarbons. Measured BTEX, TPH, TEH, numerous soil chemistry characteristics, and general characteristics of the subsurface diesel fuel and water.]

**Custer, T. W. and P. H. Albers.** 1980. Response of captive, breeding mallards to oiled water. J. Wildl. Manage. **44**(4):915-918.

Keywords : mallard, oil slick, Oone, Prudhoe Bay crude oil, crude oil, fresh water, behavior, bird, oiled, time

[ Behavioral response of mallard ducks to Prudhoe Bay crude oil slicks on water basins. Water basins were oiled with either 5 or 100  $\mu$ l of oil and monitored with time-lapse cameras for 24 hr before and after water treatment. Measured time of first entry and amount of time spent on the water.]

**Daan, R. and M. Mulder.** 1996. On the short-term and long-term impact of drilling activities in the Dutch sector of the North Sea. ICES J. Marine Sci. **53**():1036-1044.

Keywords : drilling mud, discharges, oil-based, water-based, benthic, macrofauna, crude oil, North Sea, Ofour, salt water, marine invertebrate

[ Effects of oil-based and water-based drilling muds on benthic fauna at offshore drilling platforms in the North Sea.]

**Daan, R., M. Mulder, and A. Van Leeuwen.** 1994. Differential sensitivity of macrozoobenthic species to discharges of oil-contaminated drill cuttings in the North Sea. *Netherlands J. Sea Res.* **33**(1):113-127.

Keywords : North Sea, Netherlands, survey, oil-based, drilling mud, water-based, abundance, polychaete, crustacean, echinoderm, bivalve, Ofour, salt water, marine invertebrate, coast  
[ Assessment of the effects of discharged drill cuttings on macrobenthos in the North Sea off the coast of the Netherlands. Fifteen transect surveys extending from <40 m to 5000 m from the drilling platform were conducted between 1985 and 1992. Eleven of the surveys dealt with oil-based drilling muds and four dealt with water-based drilling muds. Measured abundance of polychaetes, molluscs, crustaceans, and echinoderms.]

**Dahlmann, G., D. Timm, C. Aeverbeck, C. Camphuysen, H. Skov, and J. Durinck.** 1994. Oiled seabirds -- comparative investigations on oiled seabirds and oiled beaches in the Netherlands, Denmark and Germany (1990-93). *Marine Pollut. Bull.* **28**(5):305-310.

Keywords : oiled, Denmark, bird, Netherlands, Germany, beach, salt water, Oone, inventory, petroleum products, feathers, coast  
[ Results of a 3-year assessment of oil pollution chemicals found on the beaches and on bird feathers from the coasts of Netherlands, Denmark, and Germany.]

**Daniels, C. B., C. B. Henry, and J. C. Means.** 1990. Coastal oil drilling produced waters: chemical characterization and assessment of genotoxicity using chromosomal aberrations in *Cyprinodon variegatus*. W. G. Landis and W. H. van der Schalie (eds.), *Aquatic Toxicology and Risk Assessment: Thirteenth Volume*, ASTM STP 1096, pp.356-371. American Society for Testing and Materials, Philadelphia.

Keywords : waste water, sediment, oilfield, sheepshead minnow, fish, genotoxic, chromosome, salt water, Louisiana, Othree, petroleum, water  
[ Characterization of petroleum compounds in produced waters of coastal oilfields in Louisiana and an assessment of the genotoxicity of the water using embryonic sheepshead minnows.]

**Daniels, C. B. and J. C. Means.** 1989. Assessment of the genotoxicity of produced water discharges associated with oil and gas production using a fish embryo and larval test. *Marine Environ. Res.* **28**(1-4):303-307.

Keywords : waste water, Othree, fish, embryo, oilfield, Louisiana, sheepshead minnow, salt water, genotoxic, chromosome, water  
[ Assessment of the genotoxicity of produced water from coastal oilfields in Louisiana; use of sheepshead minnow embryos to determine the incidence of chromosomal aberrations.]

**Danovaro, R., M. Fabiano, and M. Vincx.** 1995. Meiofauna response to the *Agip Abruzzo* oil spill in subtidal sediments of the Ligurian Sea. *Mar. Pollut. Bull.* **30**(2):133-145.

Keywords : spill, crude oil, subtidal, sediment, benthic, monitoring, chemical characteristics, density, petroleum hydrocarbons, physical characteristics, salt water, Ofour, marine invertebrate, hydrocarbons

[ A benthic monitoring study was interrupted by a large oil spill that drifted into the study area in the



Ligurian Sea (Italy). Sediment samples were collected for one year (4 mo before and 8 mo after the spill). Measured physical and chemical characteristics of the sediment, total hydrocarbons, and meiofauna densities.]

**Dauvin, J.** 1998. The fine sand *Abra alba* community of the Bay of Morlaix twenty years after the Amoco Cadiz oil spill. Mar. Pollut. Bull. **36**(9):669-676.

Keywords : community, Amoco Cadiz, crude oil, spill, long-term, fish, France, abundance, biomass, dominance, macroinvertebrate, salt water, marine invertebrate, Ofour, species

[ A long-term (1977-96) assessment of the effects of the Amoco Cadiz oil spill on the macrobenthic and fish communities of the fine sand bottom environment of the Bay of Morlaix, France. Measured species and trophic abundance and dominance, and biomass.]

**Dauvin, J.-C. and F. Gentil.** 1990. Conditions of the peracarid populations of subtidal communities in northern Brittany ten years after the *Amoco Cadiz* oil spill. Mar. Pollut. Bull. **21**(3):123-130.

Keywords : population, subtidal, community, Amoco Cadiz, spill, recovery, sediment, survey, density, amphipod, Ofour, salt water, marine invertebrate

[ An assessment of the recovery of peracarid (amphipods, isopods, mysids, etc.) populations in the sediments of coastal Brittany 10 years after the Amoco Cadiz oil spill. A total of 19 sites in three locations were sampled and compared to the results of surveys at the same sites before the spill and during the 3 yr after the spill. Identified and determined the density of all peracarids.]

**Davenport, J.** 1982. Oil and planktonic ecosystems. Phil. Trans. R. Soc. Lond. **B 297**():369-384.

Keywords : ecosystem, review, experiment, survey, spill, population, community, Ofour, salt water, fresh water, marine invertebrate, marine plant, freshwater invertebrate, freshwater plant, plankton, phytoplankton, zooplankton

[ A review of the effect of oil pollution on plankton. Discusses evidence from laboratory experiments, enclosed ecosystem experiments, and field studies.]

**Davies, J. M., I. E. Baird, L. C. Massie, S. J. Hay, and A. P. Ward.** 1980. Some effects of oil-derived hydrocarbons on a pelagic food web from observations in an enclosed ecosystem and a consideration of their implications for monitoring. Rapp. P. -v. Reun. Cons. int. Explor. Mer. **179**():201-211.

Keywords : ecosystem, community, population, monitoring, North Sea crude oil, crude oil, zooplankton, phytoplankton, concentration, experiment, chemical characteristics, chlorophyll, density, microbes, Ofour, salt water, marine invertebrate, marine plant, North Sea, time, water, hydrocarbons

[ Assessment of the effects of the water-soluble fraction of North Sea crude oil on zooplankton and phytoplankton in an enclosed ecosystem. Oil concentration was 100 ppb, experiment duration was 3 mo., and samples were taken from up to six depths at frequencies of one to six times per week. Measured physical and chemical characteristics of the water, chlorophyll *a*, <sup>14</sup>C fixation, particulate C & N, phytoplankton and zooplankton density, and hydrocarbon concentrations.]

**Davis, J. E. and S. S. Anderson.** 1976. Effects of oil pollution on breeding grey seals. Marine Pollut.

Bull. 7(6):115-118.

Keywords : seals, survival, oiled, spill, reproduction, United Kingdom, mammal, Otter, salt water, oiling, coast, Wales, washing

[ Observations on the oiling of breeding grey seals on the coast of Wales and the consequences for survival; also, attempts at washing oiled seals.]

**Davis, P. H., T. W. Schultz, and R. B. Spies.** 1981. Toxicity of Santa Barbara seep oil to starfish embryos: Part 2 -- the growth bioassay. Mar. Environ. Res. 5(4):287-294.

Keywords : toxicity, embryo, growth, Santa Barbara crude oil, static, length, development, abnormalities, starfish, salt water, Ofour, marine invertebrate

[ Starfish embryos exposed to 100% water-soluble fraction (WSF) of Santa Barbara crude oil in a 48-hr static bioassay. Three experiments conducted; determine effect of length of exposure, determine most sensitive stage of development, and determine effect of ageing the WSF mixture. Measured length and incidence of abnormal development of embryos.]

**Davis, P. H. and R. B. Spies.** 1980. Infaunal benthos of a natural petroleum seep: study of community structure. Mar. Biol. 59():31-41.

Keywords : community, structure, oil seep, California, density, species, diversity, composition, Ofour, salt water, marine invertebrate

[ Comparison of the infaunal benthos at a natural oil seep location and a comparison site near Santa Barbara, California during the period 1975-78. Measured organism density, number of species, diversity indices, and size-class distribution of two species.]

**Davis, R. W.** 1990. Advances in rehabilitating oiled sea otters: the Valdez experience. Wildl. J. 13(3):30-41.

Keywords : oiled, sea otter, spill, Alaska, Prudhoe Bay crude oil, crude oil, mammal, rehabilitation, Otter, salt water, Exxon Valdez

[ Description of the procedures and facilities used to rehabilitate oiled sea otters from the Exxon Valdez oil spill in Alaska.]

**Davis, R. W., T. M. Williams, J. A. Thomas, R. A. Kastelein, and L. H. Cornell.** 1988. The effects of oil contamination and cleaning on sea otters (*Enhydra lutris*). II. Metabolism, thermoregulation, and behavior. Can. J. Zool. 66(12):2782-2790.

Keywords : cleaning, sea otter, metabolism, behavior, development, methods, oiled, mammal, Otter, fur, salt water, thermoregulation

[ Development of methods for cleaning oiled sea otters; also observations on thermoregulation, metabolism, and behavior.]

**Davison, W., C. E. Franklin, J. C. McKenzie, and P. W. Carey.** 1993. The effects of chronic exposure to the water soluble fraction of fuel oil on an Antarctic fish *Pagothenia borchgrevinki*. Comp. Biochem. Physiol. 104C(1):67-70.

Keywords : diesel fuel, fuel oil, Antarctic, fish, Ofour, physiology, salt water, water

[ Physiological effects in an Antarctic fish following experimental exposure to water soluble fractions of

diesel fuel for 7 days.]

**Davison, W., C. E. Franklin, J. C. McKenzie, and M. C. R. Dougan.** 1992. The effects of acute exposure to the water soluble fraction of diesel fuel oil on survival and metabolic rate of an Antarctic fish (*Pagothenia borchgrevinki*). *Comp. Biochem. Physiol.* **102C**(1):185-188.

Keywords : Othree, diesel fuel, fuel oil, survival, Antarctic, fish, physiology, metabolism, salt water, acute, water, blood

[ Effects on an Antarctic fish of acute exposure to the water soluble fraction of diesel fuel; physiology, metabolism, and blood chemistry.]

**Day, R. H., S. M. Murphy, J. A. Wiens, G. D. Hayward, E. J. Harner, and B. E. Lawhead.** 1997. Effects of the *Exxon Valdez* oil spill on habitat use by birds along the Kenai Peninsula, Alaska. *The Condor* **99**(3):728-742.

Keywords : Exxon Valdez, spill, habitat, bird, Alaska, coast, oiling, Prudhoe Bay crude oil, abundance, salt water, Oone, Kenai Peninsula, species, density

[ Assessment of the effects of the Exxon Valdez oil spill on habitat use by 34 species of birds along the coast of the Kenai Peninsula, Alaska. Study began in late summer 1989 and ended in late summer 1991. Measured bird density, degree of oiling, habitat measures, and degree of disturbance from cleanup.]

**Day, R. H., S. M. Murphy, J. A. Wiens, G. D. Hayward, E. J. Harner, and L. N. Smith.** 1997. Effects of the *Exxon Valdez* oil spill on habitat use by birds in Prince William Sound, Alaska. *Ecological Applications* **7**(2):593-613.

Keywords : Exxon Valdez, marine birds, crude oil, habitat, recovery, salt water, Oone, bird, spill

[ Effects of oil spill on habitat use by birds.]

**Dean, T. A., M. S. Stekoll, S. C. Jewett, R. O. Smith, and J. E. Hose.** 1998. Eelgrass (*Zostera marina* L.) in Prince William Sound, Alaska: effects of the *Exxon Valdez* oil spill. *Mar. Pollut. Bull.* **36**(3):201-210.

Keywords : Prince William Sound, Alaska, Exxon Valdez, oiled, petroleum hydrocarbons, sediment, time, eelgrass, growth, reproduction, Osix, salt water, marine plant, spill, petroleum, hydrocarbons

[ Assessment of the effects of the Exxon Valdez oil spill on eelgrass in Prince William Sound, Alaska. Measured six characteristics of eelgrass in 1990 and two characteristics in 1991, 1993, and 1995. Compared oiled sites with reference sites. Also tracked petroleum hydrocarbons in sediments during the same time period.]

**Decker, C. J. and J. W. Fleeger.** 1984. The effect of crude oil on the colonization of meiofauna into salt marsh sediments. *Hydrobiologia* **118**():49-58.

Keywords : crude oil, salt marsh, sediment, South Louisiana crude oil, Louisiana, concentration, aromatic hydrocarbons, density, species diversity, diversity, Ofour, salt water, marine invertebrate

[ Assessment of the effect of South Louisiana crude oil on the colonization of meiofauna into sediments

of a Louisiana salt marsh. Employed 45 experimental trays of sediment mixed with three concentrations of crude oil; trays were placed in the marsh to receive natural colonization over a 60 da period. Measured aromatic hydrocarbon concentration, meiofauna density, and species diversity.]

**DeGange, A. R., A. M. Doroff, and D. H. Monson.** 1994. Experimental recovery of sea otter carcasses at Kodiak Island, Alaska, following the Exxon Valdez oil spill. *Marine Mammal Sci.* **10**(4):492-496.

Keywords : recovery, sea otter, carcass, Alaska, Exxon Valdez, spill, experiment, Prudhoe Bay crude oil, crude oil, mammal, Otwo, salt water

[ Results of a sea otter carcass recovery experiment several months after the Exxon Valdez oil spill.]

**DeGraeve, G. M., R. G. Elder, D. C. Woods, and H. L. Bergman.** 1982. Effects of naphthalene and benzene on fathead minnows and rainbow trout. *Arch. Environ. Contam. Toxicol.* **11**(4):487-490.

Keywords : naphthalene, rainbow trout, eggs, toxicity, growth, survival, benzene, fathead minnow, fry, Othree, fresh water, fish, juvenile, acute

[ Effects of naphthalene and benzene on juvenile rainbow trout, fathead minnows, and fathead minnow eggs and fry; acute toxicity for the trout and adult fathead minnows and growth and survival for the fry and eggs.]

**Dehrmann, A.** 1994. South African oil spill: clean-up continues, thousands of penguins released after treatment. *Penguin Conserv.* **7**(5):10-11.

Keywords : spill, penguin, oiled, South Africa, population, salt water, Oone, rehabilitation, fuel oil, bird

[ Follow-up report on the consequences of the "Apollo Sea" oil spill.]

**Dehrmann, A.** 1994. Penguins affected by oil spill in South African waters. *Penguin Conserv.* **7**(2):8-12.

Keywords : penguin, spill, water, fuel oil, rehabilitation, South Africa, salt water, Oone, bird

[ Report of the effects on penguins of a large spill of heavy fuel oil from the "Apollo Sea".]

**Deis, D. R., N. G. Tavel, P. Masciangioli, C. Villoria, M. A. Jones, G. F. Ortega, and G. R. Lee.** 1997. Orimulsion: research and testing and open water containment and recovery trials.

Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.459-467. Edition API #4651. American Petroleum Institute. Washington, DC.

Keywords : Orimulsion, research, recovery, review, community, beach, spill, seagrass, mangrove, marine invertebrate, containment, Onine, salt water, technical, behavior, water

[ Chemical and physical properties of orimulsion and its behavior in water. A review of the effects of orimulsion on seagrass, mangroves, biofouling communities, and sand beach communities. Also, containment and recovery testing and response strategies for orimulsion spills.]

**Deka, S., A. Devi, H. P. Barthakur, and L. C. Kagti.** 1997. Studies on the impact of crude oil

pollution on the physico-chemical properties, nature of micro-organisms and growth of rice plants in soil. *J. Environ. Biol.* **18**(2):167-171.

Keywords : crude oil, growth, freshwater plant, soil, microbes, Oseven, plant, experiment

[ Growth of rice plants in a pot culture experiment wherein the soil was amended with varying amounts of crude oil; soil properties and micro-organisms were also evaluated.]

**Delille, D., A. Basseres, and A. Dessommes.** 1997. Seasonal variation of bacteria in sea ice contaminated by diesel fuel and dispersed crude oil. *Microb. Ecol.* **33**():97-105.

Keywords : seasonal, bacteria, crude oil, Antarctic, fertilizer, diesel fuel, abundance, petroleum hydrocarbons, Ofour, salt water, marine invertebrate, microbes, population, community

[ Effects of petroleum contamination of Antarctic sea ice. Sea ice exposed to either crude oil, crude oil plus fertilizer, diesel fuel, or diesel fuel plus fertilizer. Measured seasonal (Apr.-Nov.) pattern of total bacterial abundance, mean cell volume, and abundance of three categories of bacteria in sea ice and underlying sea water.]

**Delille, D., A. Basseres, A. Dessommes, and C. Rosiers.** 1998. Influence of daylight on potential biodegradation of diesel and crude oil in Antarctic seawater. *Mar. Environ. Res.* **45**(3):249-258.

Keywords : biodegradation, diesel, Arabian Light crude oil, crude oil, Antarctic, microbes, community, light, abundance, cell, Oten, salt water, miscellaneous

[ Assessed the effects of crude oil and diesel oil addition to Antarctic sea water on the bacterial community in covered and non-covered mesocosms during 1991-93. Bacterial changes were monitored for 2 or 5 wks. Treatments were open and covered controls, diesel oil, and Arabian Light crude oil. Measured bacterial abundance and mean cell volumes.]

**Derenbach, J. B. and M. V. Gereck.** 1980. Interference of petroleum hydrocarbons with the sex pheromone reaction of *Fuscus vesiculosus* (L.). *J. Exp. Mar. Biol. Ecol.* **44**():61-65.

Keywords : petroleum hydrocarbons, pheromone, algae, diesel fuel, Iranian crude oil, crude oil, alkane, aromatic, concentration, chemotaxis, Osix, salt water, marine plant

[ Assessment of the chemotactic response of brown algae spermatozoids to diesel fuel, Iranian crude oil, and several alkane and aromatic components. Measured the concentration required to elicit a chemotactic response.]

**Dey, A. C., J. W. Kiceniuk, U. P. Williams, R. A. Khan, and J. F. Payne.** 1983. Long term exposure of marine fish to crude petroleum -- I. Studies on liver lipids and fatty acids in cod (*Gadus morhua*) and winter flounder (*Pseudopleuronectes americanus*). *Comp. Biochem. Physiol.* **75C**(1):93-101.

Keywords : long-term, fish, liver, Venezuelan crude oil, crude oil, growth, physiology, tissue, winter flounder, cod, Othree, salt water, flounder, biochemistry

[ Effects on cod and winter flounder of exposure to Venezuelan crude oil for 24 weeks; growth, physiology, tissue biochemistry.]

**deZwart, D. and W. Slooff.** 1987. Toxicity of mixtures of heavy metals and petrochemicals to

*Xenopus laevis*. Bull. Environ. Contam. Toxicol. **38**(2):345-351.

Keywords : toxicity, metals, larvae, petroleum hydrocarbons, combination, clawed frog, amphibian, Othree, fresh water

[ Assessment of the toxicity to larvae of clawed toads of combinations of metals and petroleum-derived compounds.]

**Diamond, J. M.** 1982. How eggs breathe while avoiding desiccation and drowning. Nature **295**(5844):10-11.

Keywords : eggs, bird, physiology, diffusion, dessication, egg shell, Oone

[ Discourse on mechanisms and adaptations of eggs for control of gas diffusion and dessication.]

**Dierschke, V.** 1994. The influence of oil-polluted plumage on survival and body mass of purple sandpipers *Calidris maritima* at Helgoland. (Text in German, English abstract). Vogelwelt **115**(5):253-255.

Keywords : plumage, survival, weight, bird, Germany, oiled, salt water, Oone, oiling, sandpiper

[ Discussion of the effects of plumage oiling on the body weight and survival of purple sandpipers.]

**Dieter, M. P.** 1976. The effects of petroleum hydrocarbons on aquatic birds. Anonymous. Sources, Effects, and Sinks of Hydrocarbons in the Aquatic Environment, pp.438-446. American Institute of Biological Sci. Arlington, VA.

Keywords : spill, bird, research, Oone, hydrocarbons

[ Overview of the effects of oil on aquatic birds and a discussion of oil research at the Patuxent Wildlife Research Center.]

**Dillon, T. M., J. M. Neff, and J. S. Warner.** 1978. Toxicity and sublethal effects of No. 2 fuel oil on the supralittoral isopod *Lygia exotica*. Bull. Environ. Contam. Toxicol. **20**(3):320-327.

Keywords : toxicity, sublethal, lethal, No.2 fuel oil, static, respiration, concentration, petroleum hydrocarbons, spill, aromatic hydrocarbons, isopod, salt water, Ofour, marine invertebrate

[ Assessed the effects of water-soluble fractions (WSF) and oil-in-water dispersions (OWD) of No. 2 fuel oil on a marine isopod. Adult isopods were exposed to OWD of 1-1000 ppm or WSF of 5-100% of the stock solution for 96 hr in a static bioassay. Measured death, respiration rates, actual exposure concentrations, and whole body concentrations of petroleum hydrocarbons for isopods collected from a spill site.]

**Dixon, T. J. and T. R. Dixon.** 1976. *Olympic Alliance* oil spillage. Marine Pollut. Bull. **7**(5):86-90.

Keywords : spill, bird, crude oil, England, population, salt water, Oone

[ Description of the Olympic Alliance oil spill and the effects on seabirds.]

**Dobroski, C. J., Jr. and C. E. Epifanio.** 1980. Accumulation of benzo

[a]pyrene in a larval bivalve via trophic transfer. Can. J. Fish. Aquat. Sci. **37**():2318-2322.

Keywords : accumulation, benzo

[a]pyrene, bivalve, transfer, uptake, depuration, labelled, larvae, rate, Ofour, algae, salt water, marine

invertebrate, marine plant

[ Determination of the uptake and depuration of labelled benzo

[a]pyrene by a diatom and the subsequent uptake by feeding bivalve larvae. Measured accumulation rate and depuration rate for diatoms and accumulation rate for bivalve larvae; also calculated accumulation efficiencies.]

**Donahue, W. H., R. T. Wang, M. Welch, and J. A. Colin Nicol.** 1977. Effects of water-soluble components of petroleum oils and aromatic hydrocarbons on barnacle larvae. *Environ. Pollut.* **13**(3):187-202.

Keywords : aromatic hydrocarbons, barnacle, larvae, embryo, crude oil, Bunker C, No.2 fuel oil, static, acute, development, hatching, phototaxis, Ofour, salt water, marine invertebrate

[ Assessment of the effects on larvae of two barnacles of four crude oils, Bunker C, No. 2 fuel oil, used and unused crankcase oil, and 18 aromatic hydrocarbons. Used a 1-hr static bioassay employing 10-100% water-soluble fractions (WSF) of each test substance to test for acute effects. No. 2 fuel oil WSF evaluated for effects on embryo development and hatching. Unweathered and partially-weathered No. 2 fuel oil, and two aromatics evaluated for effects on larval phototaxis.]

**Dorn, P. B., T. E. Vipond, J. P. Salanitro, and H. L. Wisniewski.** 1998. Assessment of the acute toxicity of crude oils in soils using earthworms, microtox, and plants. *Chemosphere* **37**(5):845-860.

Keywords : acute, toxicity, crude oil, soil, plant, bacteria, earthworm, germination, growth, concentration, survival, weight, fresh water, Ofive, freshwater invertebrate, freshwater plant

[ Assessment of the effects of an oil spill on soil quality. Exposed earthworms (14 da toxicity test), Microtox bacteria, and plant seeds of lettuce, corn, wheat, rye, and wild oat (14 da germination and growth) to soil treated with varying concentrations of light, medium, and heavy crude oils. Used two types of soil. Measured survival, germination, and plant weight. Calculated LC50, EC50, NOEC, and IC25 values.]

**Douabul, A. A.-Z. and N. A. Al-Shiwafi.** 1998. Dissolved/dispersed hydrocarbons in the Arabian region. *Mar. Pollut. Bull.* **36**(10):844-850.

Keywords : Arabian Gulf, Red Sea, Gulf of Aden, saturated, aromatic hydrocarbons, petroleum hydrocarbons, salt water, Oten, miscellaneous

[ Water samples collected from 110 stations in the Arabian Gulf, Arabian Sea, Guld of Aden, and southern Red Sea during Nov.-Dec. 1996. Water analyzed for total saturated and aromatic hydrocarbons.]

**Dow, R. L.** 1978. Size-selective mortalities of clams in an oil spill site. *Mar. Pollut. Bull.* **9**(2):45-48.

Keywords : clam, bivalve, spill, No.2 fuel oil, jet fuel, Maine, sediment, growth, survival, Ofour, salt water, marine invertebrate

[ Determination of the effects on a clam species of a 1971 spill of No. 2 fuel oil and JP5 jet fuel along the coast of Maine. In 1976, collected live and dead clams from pits dug into the sediment. Measured annual growth of clams.]

**Downing, K. and M. Reed.** 1996. Object-oriented migration modelling for biological impact assessment. *Ecol. Modelling* **93**(1-3):203-219.

Keywords : model, spill, behavior, ringed seal, polar bear, migration, salt water, mammal, Otter, seals

[ Use of an animal migration model for assessing the potential biological effects of oil spills. Hypothetical spills in the Barents Sea were linked to migration behaviors of ringed seal and polar bear.]

**Downing, N. and C. Roberts.** 1993. Has the Gulf War affected coral reefs of the northwestern Gulf? *Mar. Pollut. Bull.* **27**(1):149-156.

Keywords : coral reef, survey, Kuwait, Saudi Arabia, survival, diversity, fish, community, age, structure, population, density, sea urchin, Ofour, salt water, marine invertebrate

[ Survey of nearshore and offshore coral reefs in Kuwait and Saudi Arabia performed in late 1992 as a followup to a survey performed in July 1991. Measured survival of coral reefs, diversity of associated fish communities, age structure of several fish populations, and density of sea urchins. Compared results with 1991 sampling and several years of prewar information.]

**Duffy, D. C.** 1977. Incidence of oil contamination on breeding common terns. *Bird-Banding* **48**(4):370-371.

Keywords : oiled, bird, tern, New York, salt water, Otter, plumage, gull

[ Report of the incidence of oiled birds in common terns of Great Gull Island, NY during the years 1973-76.]

**Duffy, L. K., R. T. Bowyer, J. W. Testa, and J. B. Faro.** 1993. Differences in blood haptoglobin and length--mass relationships in river otters (*Lutra canadensis*) from oiled and nonoiled areas of Prince William Sound, Alaska. *J. Wildl. Dis.* **29**(2):353-359.

Keywords : blood, river otter, oiled, Prince William Sound, Alaska, weight, mammal, Otter, Prudhoe Bay crude oil, crude oil, physiology, salt water

[ Comparison of blood chemistry and body weight of river otters from oiled and nonoiled areas of Prince William Sound, Alaska.]

**Duffy, L. K., R. T. Bowyer, J. W. Testa, and J. B. Faro.** 1994. Evidence for recovery of body mass and haptoglobin values of river otters following the Exxon Valdez oil spill. *J. Wildl. Dis.* **30**(3):421-425.

Keywords : recovery, river otter, spill, blood, weight, oiled, Prince William Sound, Alaska, physiology, Prudhoe Bay crude oil, crude oil, mammal, Otter, salt water

[ Measurement of blood chemistry and body weight of river otters from oiled and nonoiled areas of Prince William Sound, Alaska during 1990-92.]

**Duffy, L. K., R. T. Bowyer, J. W. Testa, and J. B. Faro.** 1994. Chronic effects of the *Exxon Valdez* oil spill on blood and enzyme chemistry of river otters. *Environ. Toxicol. Chem.* **13**(4):643-647.

Keywords : Exxon Valdez, spill, blood, river otter, oiled, Prince William Sound, Alaska, Prudhoe Bay crude oil, crude oil, physiology, mammal, salt water, Otter



[ Comparison of blood characteristics of river otters from oiled and nonoiled areas of Prince William Sound, Alaska in 1991.]

**Duke, N. C., Z. S. Pinzon M., and M. C. Prada T.** 1997. Large-scale damage to mangrove forests following two large oil spills in Panama. *Biotropica* **29**(1):2-14.

Keywords : spill, coast, tanker, diesel fuel, Bunker C, crude oil, sublethal, mangrove, salt water, marine plant, Osix, structure, Caribbean, Panama, estimate

[ Discussion of the damage to mangrove forests caused by two oil spills in or near Bahia Las Minas on the Caribbean coast of Panama. A 1968 tanker spill of diesel fuel and Bunker C and a 1986 land tank rupture involving crude oil. Estimates of deforestation in 1968 and deforestation plus sublethal effects on mangroves in 1986.]

**DuMont, P. G.** 1977. Oiled birds seen at Ocean City, Maryland. *Maryland Birdlife* **33**(1):12-13.

Keywords : oiled, bird, plumage, salt water, Oone, Maryland, species

[ Report of sightings of oiled plumage on several species of seabirds near Ocean City, MD.]

**Dunnet, G. M.** 1982. Oil pollution and seabird populations. *Phil. Trans. R. Soc. Lond. B* **297**():413-427.

Keywords : population, spill, Europe, bird, salt water, Oone, history, relation

[ Good discussion of the relation between oil spills and seabird populations of western Europe.]

**Dunnet, G. M.** 1987. Seabirds and North Sea oil. *Phil. Trans. R. Soc. Lond. B* **316**():513-524.

Keywords : North Sea, population, bird, salt water, Oone, relation

[ Discussion of the relation between North Sea oil exploitation and seabird populations.]

**Eastin, W. C. and D. J. Hoffman.** 1979. Biological effects of petroleum on aquatic birds.

Anonymous. Conference on Assessment of Ecological Impacts of Oil Spills, pp.562-582. American Institute of Biological Sci. Arlington, VA.

Keywords : bird, research, eggs, ingestion, physiology, metals, embryo, Oone, spill

[ Discussion of the effects of oil on aquatic birds using results of studies performed at the Patuxent Wildlife Research Center.]

**Eastin, W. C., Jr.** 1979. Methods used at Patuxent Wildlife Research Center to study the effects of oil on birds. Brown CH (ed.), 1979 U.S. Fish and Wildlife Service Pollution Response Workshop, pp.60-65. U.S. Fish and Wildlife Service. Washington, DC.

Keywords : methods, research, bird, Oone

[]

**Eastin, W. C., Jr., D. J. Hoffman, and C. T. O'Leary.** 1983. Lead accumulation and depression of \*-aminolevulinic acid dehydratase (ALAD) in young birds fed automotive waste oil. *Arch. Environ. Contam. Toxicol.* **12**():31-35.

Keywords : bird, waste oil, dietary exposure, mallard, duckling, chicks, crankcase oil, pheasant, fresh water, Oone, physiology

[ Dietary exposure of mallard ducklings and pheasant chicks to waste crankcase oil; physiological effects.]

**Eastin, W. C., Jr. and H. C. Murry.** 1981. Effects of crude oil ingestion on avian intestinal function. *Canadian J. Physiol. Pharmacol.* **59**(10):1063-1068.

Keywords : crude oil, ingestion, Prudhoe Bay crude oil, mallard, duckling, intestinal function, fresh water, Oone, physiology, bird, Prudhoe Bay

[ Effects of dietary ingestion of Prudhoe Bay crude oil on intestinal function of mallard ducklings.]

**Eastin, W. C., Jr. and B. A. Rattner.** 1982. Effects of dispersant and crude oil ingestion on mallard ducklings (*Anas platyrhynchos*). *Bull. Environ. Contam. Toxicol.* **29**():273-278.

Keywords : dispersant, crude oil, ingestion, mallard, duckling, diet, Corexit 9527, weight, Prudhoe Bay crude oil, physiology, ODone, fresh water, bird, Prudhoe Bay, blood

[ Mallard ducklings were fed a diet containing Prudhoe Bay crude oil or Corexit 9527 for 9 weeks; weight and blood chemistries were measured.]

**Eberhardt, L. L. and R. A. Garrott.** 1997. Response to critique by Garshelis and Estes of *Exxon Valdez* sea otter mortality estimate. *Mar. Mammal Sci.* **13**(2):351-354.

Keywords : critique, Exxon Valdez, sea otter, estimate, Prince William Sound, spill, survival, population, Otwo, salt water, mammal

[ Response of authors to a critique of their paper on estimation of sea otter mortality in Prince William Sound following the Exxon Valdez oil spill.]

**Eganhouse, R. P., T. F. Dorsey, C. S. Phinney, and A. M. Westcott.** 1996. Processes affecting the fate of monoaromatic hydrocarbons in an aquifer contaminated by crude oil. *Environ. Sci. Technol.* **30**(11):3304-3312.

Keywords : monoaromatic, crude oil, ground water, fate, Oten, miscellaneous

[ Monoaromatic fate in an aquifer contaminated by crude oil.]

**Eisler, R.** 1973. Latent effects of Iranian crude oil and a chemical oil dispersant on Red Sea molluscs. *Israel J. Zool.* **22**():97-105.

Keywords : Iranian crude oil, crude oil, dispersant, Red Sea, predation, rate, gastropod, mussel, static, bioassay, eggs, Odfour, salt water, marine invertebrate

[ Assessment of the effect of Iranian crude oil or a chemical oil dispersant on the predation rate of a gastropod drill. Mussels and gastropod drills were exposed in a static bioassay to 10 ml/liter of crude oil or 0.003 ml/liter of dispersant for 168 h. Measured predation rates by drills and the number of egg cases deposited by drill during a 28 da period after the initial exposure period.]

**Eisler, R.** 1975. Acute toxicities of crude oils and oil-dispersant mixtures to Red Sea fishes and invertebrates. *Israel J. Zool.* **24**():16-27.

Keywords : toxicity, crude oil, Red Sea, invertebrate, dispersant, juvenile, coral, mussel, sea urchin, crab, shrimp, fish, static, bioassay, concentration, Odfour, salt water, marine invertebrate

[ Assessment of the toxicities of a Persian Gulf crude oil, a Sinai crude oil, a chemical oil dispersant and

crude oil-dispersant mixtures to adults or juveniles of 10 marine organisms (coral, two molluscs, mussel, chiton, sea urchin, hermit crab, shrimp, and two fish) with a static bioassay. Exposed organisms to varying concentrations over a 168 hr period. Calculated  $LC_{0,50,100}$  at 24, 96, and 168 hr for each type of exposure.]

**Eisler, R.** 1975. Toxic, sublethal, and latent effects of petroleum on Red Sea macrofauna.

Anonymous. 1975 Conference on Prevention and Control of Oil Pollution, pp.535-540. American Petroleum Institute. Washington DC.

Keywords : sublethal, Red Sea, macrofauna, crude oil, Iranian crude oil, dispersant, species, crustacean, echinoderm, static, flow-through, survival, blood, mussel, rate, predation, eggs, coelenterate, fish, ODfour, salt water, marine invertebrate

[ Assessment of the effects of Sinai crude oil, Iranian crude oil, chemical oil dispersant, and mixtures of dispersant and crude oils to 15 species of coelenterates, molluscs, crustaceans, echinoderms, and teleosts. Employed static tests (3 liters) and large flow-through tanks (1,500 liters). In static tests,  $LC_{0,50,100}$  was calculated for 168 hrs exposure (details reported in another publ.). In tank tests, organisms were tested at two depths and subjected to dispersant at 0.001-0.100 ml/liter, crude oils at 3.00-10.00 ml/liter, and mixtures at 0.110 ml/liter. Measured survival, blood hematocrit and a somatoliver index of rabbitfish, substrate fastening ability of mussels, tentacular pulsation rate of octocorals, predation of drills on mussels, and egg case deposition of drills.]

**Eisler, R. and G. W. Kissil.** 1975. Toxicities of crude oils and oil-dispersant mixtures to juvenile rabbitfish, *Siganus rivulatus*. Trans. Am. Fish. Soc. **104**(3):571-578.

Keywords : toxicity, rabbitfish, crude oil, juvenile, Iranian crude oil, Sinai crude oil, dispersant, static, flow-through, concentration, salinity, survival, index, depth, blood, degradation, ODthree, fish, salt water, sources

[ Assessment of Iranian crude oil, Sinai crude oil, a chemical dispersant (ST-5), and mixtures of dispersant and crude oils to juvenile rabbitfish. Employed a static test (3-liter jar) and a flow-through tank test (1,500 liters). Static tests had six concentrations for 168 hrs, four levels of salinity, and application of test substances 0-168 hrs before organism exposure. Different boiling fractions of the crude oils were also tested for the source of toxicity. Measured survival, hematocrit, and somatoliver index.  $LC_{0,50,100}$  calculated at 24, 48, 96, and 168 hrs. In tank tests, measured survival at two depths and compared results to those of the static tests.]

**Ekker, M., S.-H. Lorentsen, and N. Rov.** 1992. Chronic oil-fouling of grey seal pups at the Froan breeding ground, Norway. Marine Pollut. Bull. **24**(2):92-93.

Keywords : seals, Norway, reproduction, oiled, mammal, salt water, Otwo, oiling

[ Incidence of oiling among grey seal pups at the Froan breeding ground in Norway during 1985-89.]

**Ekundayo, E. O. and C. O. Obuekwe.** 1997. Effects of an oil spill on soil physico-chemical properties of a spill site in a typic paleudult of midwestern Nigeria. Environ. Monitor. Assess. **45**():209-221.

Keywords : spill, soil, crude oil, oilfield, fresh water, Oten, Nigeria, miscellaneous, chemical analysis, oil field

[ Chemical analysis of soil samples from an inland oil field in Nigeria.]

**El-Dip, M. A., H. F. Abou-Waly, and A. M. H. El-Naby.** 1997. Impact of fuel oil on the freshwater alga *Selenastrum capricornutum*. Bull. Environ. Contam. Toxicol. **59**(3):438-444.

Keywords : fuel oil, No.2 fuel oil, concentration, chlorophyll, survival, growth, carbohydrate, protein, algae, freshwater plant, fresh water, Oseven, water

[ Effects on a freshwater alga of exposure to four concentrations of a water extract of No. 2 fuel oil for 10 da. Measured survival, chlorophyll (a), growth, and carbohydrate and protein content.]

**Eldridge, M. B., T. Echeverria, and J. A. Whipple.** 1977. Energetics of Pacific herring (*Clupea harengus pallasi*) embryos and larvae exposed to low concentrations of benzene, a monoaromatic component of crude oil. Trans. Am. Fish. Soc. **106**(5):452-461.

Keywords : Othree, herring, embryo, larvae, salt water, benzene, fish, metabolism, energetics, Pacific, Pacific herring

[ Effects of experimental exposure to benzene on embryos and larvae of Pacific herring.]

**Elgershuizen, J. H. B. W. and H. A. M. DeKruif.** 1976. Toxicity of crude oils and a dispersant to the stony coral *Madracis mirabilis*. Mar. Pollut. Bull. **7**(2):22-25.

Keywords : toxicity, crude oil, dispersant, coral, static, bioassay, ODfour, salt water, marine invertebrate, petroleum, shell, concentration

[ Exposure of coral to four crude oils and a petroleum dispersant (Shell LTX) in a 24 hr static bioassay. Exposures were either water-soluble fraction, oil-seawater mixture, dispersant-seawater mixture, or oil-dispersant-seawater mixture in concentrations of 10-10,000 ppm. Measured degree of polyp retraction and calculated dose responses.]

**Ellenton, J. A.** 1982. Teratogenic activity of aliphatic and aromatic fractions of Prudhoe Bay crude and fuel oil No. 2 in the chicken embryo. Toxicol. Appl. Pharmacol. **63**():209-215.

Keywords : aromatic, fuel oil, chicken, embryo, crude oil, eggs, aliphatic, Prudhoe Bay crude oil, Oone, development, bird, Prudhoe Bay

[ Aliphatic and aromatic (3) fractions of No. 2 fuel oil and Prudhoe Bay crude oil were applied to chicken eggs; developmental effects on embryos were measured.]

**Engel, S. E., T. E. Roudybush, J. C. Dobbs, and C. R. Grau.** 1977. Depressed food intake and reduced reproduction in Japanese quail following a single dose of Prudhoe Bay crude oil. Mahlum D, Sikov M, Hackett P, and Andrew F (eds.), Developmental Toxicology of Energy-Related Pollutants. Seventeenth Hanford Biology Symposium, pp.27-36. U.S. Energy Research and Development Administration, Washington,DC.

Keywords : reproduction, Prudhoe Bay crude oil, crude oil, dosed, eggs, food, Japanese quail, Oone, fresh water, bird, quail, Prudhoe Bay

[ Japanese quail were dosed with Prudhoe Bay crude oil and food intake and egg production measured.]

**Engelhardt, F. R.** 1983. Petroleum effects on marine mammals. Aquatic Toxicol. **4**():199-217.

Keywords : mammal, review, uptake, metabolism, survival, behavior, physiology, pathology, skin, fur, thermoregulation, salt water, Otwa

[ A review of the effects of oil on marine mammals; adherence, uptake, metabolism, survival, behavior, thermoregulation, physiology, pathology.]

**Engelhardt, F. R., J. R. Geraci, and T. G. Smith.** 1977. Uptake and clearance of petroleum hydrocarbons in the ringed seal, *Phoca hispida*. J. Fish. Res. Board Can. **34**(1):1143-1147.

Keywords : uptake, clearance, seals, crude oil, ingestion, concentration, salt water, mammal, skin, Otwa, ringed seal

[ Exposure of ringed seals to Norman Wells crude oil either by immersion or ingestion; uptake, concentration, and clearance.]

**Engelhardt, F. R.** 1982. Hydrocarbon metabolism and cortisol balance in oil-exposed ringed seals, *Phoca hispida*. Comp. Biochem. Physiol. **72C**(1):133-136.

Keywords : hydrocarbons, metabolism, seals, ingestion, crude oil, stress, steroid, physiology, mammal, salt water, Otwa, ringed seal

[ Effects of ingestion of Norman Wells crude oil on hydrocarbon metabolism and steroid balance in ringed seals.]

**Engelhardt, F. R., M. P. Wong, and M. E. Duey.** 1981. Hydromineral balance and gill morphology in rainbow trout (*Salmo gairdneri*), acclimated to fresh and sea water, as affected by petroleum exposure. Aquatic Toxicol. **1**(1):175-186.

Keywords : gill, rainbow trout, water, crude oil, paraffin, weathered, injection, fish, fresh water, salt water, blood, emulsion, Othello, physiology, pathology

[ Effects of Norman Wells and Venezuelan crude oils and a paraffin compound, as particulate emulsions of weathered oil, water-soluble fraction only, or intraperitoneal injection, on immature rainbow trout; exposure was for 7 days. Some fish were acclimated to fresh water, some to salt water. Assessment performed on blood chemistry and gill morphology.]

**Eppley, Z. A.** 1992. Assessing indirect effects of oil in the presence of natural variation: the problem of reproductive failure in South Polar Skuas during the *Bahia Paraiso* oil spill. Marine Pollut. Bull. **25**(1):9-12.

Keywords : spill, population, diesel fuel, reproduction, South Pole, salt water, Oone, bird, skuas, time

[ Assessment of the causes of reproductive failure of a local population of South Polar Skuas; failure occurred at the time of a spill of diesel fuel.]

**Eppley, Z. A. and M. A. Rubega.** 1989. Indirect effects of an oil spill. Nature **340**(6234):513

Keywords : diesel fuel, jet fuel, bird, population, Antarctic, reproduction, salt water, Oone, spill

[ Discussion of the indirect effects on seabirds of a spill of diesel and jet fuel; avian effects ranged from very negative to slightly positive.]

**Eppley, Z. A. and M. A. Rubega.** 1990. Indirect effects of an oil spill: reproductive failure in a population of South Polar skuas following the 'Bahia Paraiso' oil spill in Antarctica. *Marine Ecol. Prog. Ser.* **67**(1):1-6.

Keywords : spill, population, diesel fuel, jet fuel, reproduction, Antarctic, salt water, Oone, bird, skuas

[ Discussion of the indirect effects of a spill of diesel fuel and jet fuel on the reproduction of a local colony of South Polar skuas.]

**Erasmus, T., R. M. Randall, and B. M. Randall.** 1981. Oil pollution, insulation and body temperatures in the jackass penguin *Spheniscus demersus*. *Comp. Biochem. Physiol.* **69A**(1):169-171.

Keywords : temperature, penguin, cleaning, oiled, salt water, Oone, insulation, bird, hypothermia, moult, plumage, water, air, oiling

[ Effect on deep body temperature of jackass penguins of oiling, oiling plus cleaning, or natural moult; temperature measured during exposure to water and air.]

**Ernst, V. V. and J. M. Neff.** 1977. The effects of the water-soluble fractions of No. 2 fuel oil on the early development of the estuarine fish, *Fundulus grandis* Baird and Girard. *Environ. Pollut.* **14**(1):25-35.

Keywords : fuel oil, fish, embryo, survival, growth, tissue, pathology, No.2 fuel oil, salt water, Othree, estuarine, concentration

[ Effects on embryos of an estuarine fish following exposure to varying concentrations of the water-soluble fraction of No. 2 fuel oil; survival, growth, and pathological evaluation of selected tissues.]

**Erwin, R. M., G. J. Smith, and R. B. Clapp.** 1986. Winter distribution and oiling of common terns in Trinidad: a further look. *J. Field Ornithol.* **57**(4):300-308.

Keywords : tern, plumage, wintering, oiled, salt water, Oone, bird, oiling

[ Report of the incidence of plumage oiling in wintering common terns in Trinidad.]

**Estes, J. A.** 1991. Catastrophes and conservation: lessons from sea otters and the *Exxon Valdez*. *Science* **254**(5038):1596

Keywords : Prudhoe Bay crude oil, sea otter, Exxon Valdez, spill, population, rehabilitation, crude oil, cost, mammal, salt water, Otwo, commentary

[ Commentary on the lessons learned from the Exxon Valdez oil spill with respect to sea otters; losses, population effects, rehabilitation.]

**Evans, G. W., M. Lyes, and A. P. M. Lockwood.** 1977. Some effects of oil dispersants on the feeding behaviour of the brown shrimp, *Crangon crangon*. *Mar. Behav. Physiol.* **4**(3):171-181.

Keywords : dispersant, feeding, shrimp, behavior, concentration, static, bioassay, Odfour, salt water, marine invertebrate

[ Assessment of the effects of three oil dispersants (BP1100X, Slickgone LT2, Tween 80) on the feeding behavior of brown shrimp. Concentrations of dispersant ranged between 1 and 1000 ppm,

depending on the dispersant. Shrimp were exposed for 24 hr in a static bioassay.]

**Evans, M. I., P. Symens, and C. W. T. Pilcher.** 1993. Short-term damage to coastal bird populations in Saudi Arabia and Kuwait following the 1991 Gulf War marine pollution. *Marine Pollut. Bull.* **27**():157-161.

Keywords : bird, population, Gulf oil spill, spill, crude oil, salt water, Oone, short-term  
[ A preliminary assessment of the short-term effects of the Gulf oil spill on seabird populations.]

**Fabricius, E.** 1959. What makes plumage waterproof? Scott P and Boyd H (eds.), Tenth Annual Report of The Waterfowl Trust, 1957-1958, pp.105-113. Vol. 10, 1957-1958. F. Bailey & Son, Ltd. Dursley, England.

Keywords : plumage, bird, Oone, waterproof, water, experiment  
[ The definitive explanation of how bird plumage repels water; includes experiments testing various alternative explanations.]

**Falk-Petersen, I.-B. and E. Kjorsvik.** 1987. Acute toxicity tests of the effects of oils and dispersants on marine fish embryos and larvae -- a review. *Sarsia* **72**():411-413.

Keywords : toxicity, dispersant, fish, embryo, larvae, review, Norway, survival, crude oil, hydrocarbons, ODthree, salt water, physiology, chromosome, cell  
[ A review of approximately 10 years of work on the toxicity of oils and dispersants to marine fish embryos and larvae; University of Tromso, Norway. Includes survival, physiological, cellular, and chromosomal effects.]

**Farrington, J. W., A. C. Davis, N. M. Frew, and K. S. Rabin.** 1982. No. 2 fuel oil compounds in *Mytilus edulis*. Retention and release after an oil spill. *Mar. Biol.* **66**():15-26.

Keywords : No.2 fuel oil, spill, uptake, depuration, clam, Cape Cod, time, aliphatic, aromatic hydrocarbons, salt water, Ofour, marine invertebrate, bivalve  
[ Assessment of uptake and depuration by a clam of No. 2 fuel oil from a spill in the Cape Cod Canal, MA. Clams sampled six times during an 86 da period following the spill. Measured aliphatic and aromatic hydrocarbons by GC/MS and calculated half lives of selected compounds.]

**Fayad, N. M., A. H. El-Mubarak, and R. L. Edora.** 1996. Fate of oil hydrocarbons in fish and shrimp after major oil spills in the Arabian Gulf. *Bull. Environ. Contam. Toxicol.* **56**(3):475-482.

Keywords : hydrocarbons, fish, shrimp, spill, Arabian Gulf, uptake, species, aliphatic, aromatic, crude oil, Othree, salt water, marine invertebrate, aromatic hydrocarbons  
[ Uptake of hydrocarbons by five species of fish and one species of shrimp after the Iran-Iraq War (1983) and the Gulf War (1991); measures of aliphatic and aromatic hydrocarbons.]

**Feder, H. M. and A. Blanchard.** 1998. The deep benthos of Prince William Sound, Alaska, 16 months after the *Exxon Valdez* oil spill. *Mar. Pollut. Bull.* **36**(2):118-130.

Keywords : Prince William Sound, Alaska, Exxon Valdez, crude oil, sediment, benthic, invertebrate, abundance, diversity, Ofour, marine invertebrate, salt water, spill  
[ Sediment samples were collected, 16 mo after the Exxon Valdez oil spill, from depths of 40 and 100

m in areas affected by the spill and in reference areas. Physical sediment characteristics and benthic invertebrate abundance and diversity were measured.]

**Feder, H. M., A. S. Naidu, and A. J. Paul.** 1990. Trace element and biotic changes following a simulated oil spill on a mudflat in Port Valdez, Alaska. *Mar. Pollut. Bull.* **21**(3):131-137.

Keywords : spill, Alaska, Prudhoe Bay crude oil, crude oil, tidal flat, sediment, copepod, time, metals, abundance, petroleum hydrocarbons, salt water, Ofour, marine invertebrate

[ Prudhoe Bay crude oil was applied to tidal flat sediments in Port Valdez, Alaska to assess effects on marine copepods and trace element changes in the sediment. Oil was added at 500, 1,000, or 2,000 ppm during low tide at five times during the period Jun.-Aug. and sampled at the next low tide. Measured total hydrocarbons, trace metals, and abundance of three copepod species.]

**Fernandes, M. B., M.-A. Sicre, A. Boireau, and J. Tronczynski.** 1997. Aquatic hydrocarbon distributions in the Seine estuary: biogenic polyaromatics and n-alkanes. *Estuaries* **20**(2):281-290.

Keywords : hydrocarbons, distribution, estuary, survey, Seine River, France, alkane, aromatic hydrocarbons, biogenic, fresh water, salt water, Oten, miscellaneous, water

[ Survey of the biogenic n-alkane and polyaromatic hydrocarbons in surface waters of the lower Seine and Seine estuary.]

**Feuston, M. H., C. E. Hamilton, C. A. Schreiner, and C. R. Mackerer.** 1997. Developmental toxicity of dermally applied crude oils in rats. *J. Toxicol. Environ. Health* **52**(1):79-93.

Keywords : toxicity, crude oil, rat, nitrogen, female, weight, development, embryo, sulfur, viscosity, Otwo, mammal

[ Pregnant rats subjected to dermal application of varying amounts of two crude oils differing in viscosity, nitrogen content, and sulfur content were assessed for effects on female weight and development of young. Some embryos were examined prior to birth, other females were permitted to deliver young; the young were followed for 3-4 wks.]

**Feuston, M. H., C. E. Hamilton, C. A. Schreiner, and C. R. Mackerer.** 1997. Developmental toxicity of dermally applied crude oils in rats. *J. Toxicol. Environ. Health* **52**(1):79-93.

Keywords : crude oil, rat, female, survival, litter, abnormalities, weight, growth, parturition, development, skin, Otwo, mammal

[ Assessment of the effects of dermal application of varying amounts of two different crude oils to the backs of pregnant rats. Oils were applied on gestation days 0-19; prenatal females were killed on GD 20, postnatal females and offspring were killed 3-4 wks postpartum. Endpoints included survival of both females, fetuses, and young; litter size, parturition date, developmental abnormalities, weight, and growth of young.]

**Feuston, M. H., C. R. Mackerer, C. A. Schreiner, and C. E. Hamilton.** 1997. Systemic toxicity of dermally applied crude oils in rats. *J. Toxicol. Environ. Health* **51**(4):387-399.

Keywords : toxicity, crude oil, rat, weight, organ, blood, pathology, mammal, Otwo, biochemical, biochemistry



[ Comparative assessment of systemic toxicity of two dermally applied crude oils; laboratory rats, body weight, organ weights, blood characteristics, biochemistry, pathology.]

**Fevolden, S. E. and S. P. Garner.** 1986. Population genetics of *Mytilus edulis* (L.) from Oslofjorden, Norway, in oil-polluted and non oil-polluted water. *Sarsia* **71**():247-257.

Keywords : population, Norway, clam, concentration, diesel fuel, enzyme, genotoxic, bivalve, salt water, Ofour, marine invertebrate

[ Assessment of the effects of oil exposure on population genetics of a species of clam in Norway. Experimental basins with two concentrations of diesel fuel were used to expose clams from late 1982 to late 1984. Electrophoresis used to measure allelic frequencies at gene loci on 17 enzymes; results compared with control basins and a fjord control.]

**Field, R., M. R. North, and J. Wells.** 1993. Nesting activity of yellow-billed loons on the Colville River delta, Alaska, after the *Exxon Valdez* oil spill. *Wilson Bull.* **105**(2):325-332.

Keywords : Alaska, Exxon Valdez, spill, Prudhoe Bay crude oil, loon, reproduction, fresh water, Oone, bird, activity

[ Assessment of nesting activity of yellow-billed loons in northern Alaska following the Exxon Valdez oil spill.]

**Fisher, W. S. and S. S. Foss.** 1993. A simple test for toxicity of Number 2 fuel oil and oil dispersants to embryos of grass shrimp, *Palaemonetes pugio*. *Mar. Pollut. Bull.* **26**(7):385-391.

Keywords : toxicity, No.2 fuel oil, dispersant, embryo, grass shrimp, shrimp, development, bioassay, concentration, Corexit 9527, Corexit 7664, survival, salinity, temperature, salt water, Odfour, marine invertebrate

[ Development of a toxicity bioassay employing embryos of the grass shrimp. Shrimp embryos were exposed to four concentrations of either the water-soluble fraction of No. 2 fuel oil, Corexit 9527, Corexit 7664, or fuel oil plus Corexit 9527 or 7664 for up to 16 da. Measured survival and the effects on toxicity of salinity and water temperature.]

**Fleeger, J. W. and G. T. Chandler.** 1983. Meiofauna responses to an experimental oil spill in a Louisiana salt marsh. *Mar. Ecol. Prog. Ser.* **11**():257-264.

Keywords : spill, Louisiana, salt marsh, South Louisiana crude oil, crude oil, density, concentration, sediment, community, structure, salt water, Ofour, marine invertebrate

[ Effects of an oil spill on meifauna of a Louisiana salt marsh were determined through use of experimental plots sprayed with South Louisiana crude oil. Plots were sampled before spraying and on days 2, 5, 10, 20, 30, 60, 95, and 144 after spraying. Measured densities of meiofauna and hydrocarbon concentrations in sediment, and calculated measures of community structure.]

**Fleming, W. J., L. Sileo, and J. C. Franson.** 1982. Toxicity of Prudhoe Bay crude oil to sandhill cranes. *J. Wildl. Manage.* **46**(2):474-478.

Keywords : Prudhoe Bay crude oil, crude oil, dosed, fresh water, physiology, pathology, crane, Oone, bird, Prudhoe Bay, necropsy, blood

[ Sandhill cranes were dosed with Prudhoe Bay crude oil for 25 days and effects assessed by clinical

signs, necropsy, blood chemistries, and histological examination.]

**Fletcher, G. L., J. W. Kiceniuk, and U. P. Williams.** 1981. Effects of oiled sediments on mortality, feeding and growth of winter flounder *Pseudopleuronectes americanus*. *Marine Ecol. - Prog. Ser.* **4()**:91-96.

Keywords : oiled, sediment, growth, winter flounder, crude oil, fish, survival, feeding, Venezuelan crude oil, salt water, Othree, flounder, experiment

[ Effects on winter flounder of exposure to sediments containing Venezuelan crude oil in three experiments of 4-5 months duration during winter and summer; measures of survival, feeding, and growth.]

**Fletcher, G. L., M. J. King, J. W. Kiceniuk, and R. F. Addison.** 1982. Liver hypertrophy in winter flounder following exposure to experimentally oiled sediments. *Comp. Biochem. Physiol.* **73C()**:457-462.

Keywords : liver, winter flounder, oiled, sediment, Venezuelan crude oil, crude oil, physiology, pathology, fish, salt water, Othree, flounder

[ Effects on the liver of winter flounder exposed to sediments oiled with Venezuelan crude oil for 4-5 months during summer and winter.]

**Flickinger, E. L.** 1981. Wildlife mortality at petroleum pits in Texas. *J. Wildl. Manage.* **45(2)**:560-564.

Keywords : Texas, bird, oilfield, refinery, fresh water, Oone, petroleum waste, oil field

[ Report of the extent of bird deaths in oil refinery sludge pits and oil-field spillage pits in Texas.]

**Flickinger, E. L. and C. M. Bunck.** 1987. Number of oil-killed birds and fate of bird carcasses at crude oil pits in Texas. *The Southwestern Naturalist* **32(3)**:377-381.

Keywords : estimate, bird, fate, fresh water, Texas, methods, waste oil, carcass, Oone, numbers

[ Evaluation of proper methods for determining the numbers of birds perishing in waste oil pits.]

**Flint, P. L. and A. C. Fowler.** 1998. A drift experiment to assess the influence of wind on recovery of oiled seabirds on St. Paul Island, Alaska. *Mar. Pollut. Bull.* **36(2)**:165-166.

Keywords : drift, experiment, recovery, oiled, Alaska, carcass, spill, Bunker C, bird, Oone, salt water

[ An experiment to assess the influence of offshore winds on carcass recovery of oiled seabirds. Experiment followed an offshore spill of Bunker C oil near St. Paul Island, Alaska. Wooden blocks were used to simulate dead seabirds.]

**Folmar, L. C., D. R. Craddock, J. W. Blackwell, G. Joyce, and H. O. Hodgins.** 1981. Effects of petroleum exposure on predatory behavior of coho salmon (*Oncorhynchus kisutch*). *Bull. Environ. Contam. Toxicol.* **27()**:458-462.

Keywords : behavior, Cook Inlet crude oil, crude oil, feeding, hydrocarbons, concentration, brain, liver, fish, predation, Othree, salt water, salmon

[ Effects of exposure to the water-soluble fraction of Cook Inlet crude oil on predatory behavior of

adult coho salmon; measures of feeding behavior and hydrocarbon concentrations in brain and liver.]

**Folmar, L. C., W. W. Dickhoff, W. S. Zaugg, and H. O. Hodgins.** 1982. The effects of aroclor 1254 and No. 2 fuel oil on smoltification and sea-water adaptation of coho salmon (*Oncorhynchus kisutch*). *Aquatic Toxicol.* **2**():291-299.

Keywords : fuel oil, combination, survival, tissue, No.2 fuel oil, PCB, biochemical, fish, Othree, fresh water, salt water, salmon, biochemistry

[ Effects of Aroclor 1254 and No. 2 fuel oil, singly and in combination, on the smoltification and sea-water adaptation of yearling coho salmon; survival and tissue biochemistry.]

**Folmar, L. C. and H. O. Hodgins.** 1982. Effects of Aroclor 1254 and No. 2 fuel oil, singly and in combination, on predator-prey interactions in coho salmon (*Oncorhynchus kisutch*). *Bull. Environ. Contam. Toxicol.* **29**(1):24-28.

Keywords : fuel oil, combination, predation, behavior, concentration, PCB, aromatic, salt water, hydrocarbons, Othree, fish, No.2 fuel oil, salmon, aromatic hydrocarbons

[ Effects of exposure to No. 2 fuel oil and Aroclor 1254, singly or in combination, on coho salmon predation behavior; measures of predation behavior and concentrations of PCBs and selected aromatic hydrocarbons.]

**Fong, W. C.** 1976. Uptake and retention of Kuwait crude oil and its effects on oxygen uptake by the soft-shell clam, *Mya arenaria*. *J. Fish. Res. Board Can.* **33**():2774-2780.

Keywords : uptake, Kuwait, Kuwait crude oil, crude oil, oxygen, clam, bivalve, distribution, petroleum hydrocarbons, tissue, respiration, Ofour, salt water, marine invertebrate

[ Exposure of soft-shell clams to water-accomodated Kuwait crude oil for 10-30 da. Measured uptake of oil particles, distribution of petroleum hydrocarbons in various tissues of the clam, and effect of exposure on respiration.]

**Ford, R. G., J. A. Wiens, D. Heinemann, and G. L. Hunt.** 1982. Modelling the sensitivity of colonially breeding marine birds to oil spills: guillemot and kittiwake populations on the Pribilof Islands, Bering Sea. *J. Appl. Ecol.* **19**():1-31.

Keywords : marine birds, bird, spill, guillemot, population, kittiwake, salt water, Oone, perturbation, Bering Sea, model, simulation

[ Simulation modeling exercise of the population response of long-lived marine birds to environmental disturbances, such as oil spills. Special emphasis on guillemots and kittiwakes.]

**Fossato, V. U. and W. J. Canzonier.** 1976. Hydrocarbon uptake and loss by the mussel *Mytilus edulis*. *Mar. Biol.* **36**():243-250.

Keywords : petroleum hydrocarbons, uptake, mussel, depuration, diesel fuel, bivalve, Ofour, salt water, marine invertebrate

[ Assessment of the uptake and depuration of suspended diesel fuel by blue mussels in a continuous-flow experimental system. Mussels exposed to 200-400 ppb diesel fuel for up to 41 da and depurated for up to 32 da.]

**Fowler, A. C. and P. L. Flint.** 1997. Persistence rates and detection probabilities of oiled king eider carcasses on St. Paul Island, Alaska. *Mar. Pollut. Bull.* **34**(7):522-526.

Keywords : persistence, detection, oiled, eiders, carcass, Alaska, beach, sex, rocky shore, sandy beach, Oone, bird, salt water

[ A study of king eider carcass persistence and detection probabilities on four sand or rocky beaches on St. Paul Island, Alaska. Searches carried out over a 6-da period; results evaluated according to beach type and sex of carcass.]

**Fowler, G. S., J. C. Wingfield, and P. D. Boersma.** 1995. Hormonal and reproductive effects of low levels of petroleum fouling in Magellanic penguins (*Spheniscus magellanicus*). *The Auk* **112**(2):382-389.

Keywords : penguin, crude oil, dispersant, reproduction, Argentina, hormone, ODone, salt water, bird, spill, washing

[ Effects of exposure to crude oil and dispersant washing on hormonal production and subsequent reproduction in Magellanic penguins of coastal Argentina.]

**Fricke, A. H., H. FK. O. Hennig, and M. J. Orren.** 1981. Relationship between oil pollution and psammolittoral meiofauna density of two South African beaches. *Mar. Environ. Res.* **5**(1):59-77.

Keywords : density, crude oil, fuel oil, sediment, concentration, aromatic hydrocarbons, invertebrate, Ofour, salt water, marine invertebrate

[ Assessment of the effect of crude oil and fuel oil from a ship collision on meiofauna of two South African beaches. Two affected beaches (one cleaned, one undisturbed) were sampled by taking sediment cores four times between March 1978 and March 1979. Measured meiofauna density and concentrations of aromatic hydrocarbons in sediment.]

**Frithsen, J. B., R. Elmgren, and D. T. Rudnick.** 1985. Responses of benthic meiofauna to long-term, low-level additions of No. 2 fuel oil. *Mar. Ecol. Prog. Ser.* **23**():1-14.

Keywords : benthic, No.2 fuel oil, fuel oil, flow-through, experiment, concentration, abundance, community, structure, sediment, population, Ofour, salt water, marine invertebrate, invertebrate

[ Assessment of the effects of No. 2 fuel oil on benthic meiofauna in a flow-through experimental mesocosm system. One experiment had an average concentration of 190 ppb for 168 da followed by a 64 da period of no oil additions. A second experiment had an average concentration of 90 ppb followed by a 386 da period of no oil additions. Measured meiofauna abundance, community structure, recruitment, and petroleum concentrations in sediment.]

**Fry, D. M.** 1991. Point-source and non-point-source problems affecting seabird populations. D. R. McCullough and R. H. Barrett (eds.), *Wildlife 2001: Populations*, pp.547-562. Elsevier Science Publishers, LTD, Oxford, England.

Keywords : population, spill, discharges, chronic, bird, species, Oone

[ Presentation and discussion of the numerous point- and non-point-source threats to seabird populations throughout the world; includes short sections on oil spills and chronic oil discharges.]

**Fry, D. M. and L. A. Addiego.** 1987. Hemolytic anemia complicates the cleaning of oiled seabirds. *Wildl. J.* **10**(3):3-8.

Keywords : cleaning, oiled, bird, rehabilitation, crude oil, petroleum products, spill, salt water, Oone, anemia

[ Discussion of hemolytic anemia in oiled birds and how to deal with it in oiled bird rehabilitation.]

**Fry, D. M. and L. J. Lowenstine.** 1985. Pathology of common murres and Cassin's auklets exposed to oil. *Arch. Environ. Contam. Toxicol.* **14**(6):725-737.

Keywords : pathology, Cassin's auklet, Bunker C, crude oil, common murre, salt water, Oone, bird

[ Pathological assessment of common murres and Cassin's auklets exposed to Bunker C and Santa Barbara crude oil.]

**Fry, D. M., J. Swenson, L. A. Addiego, C. R. Grau, and A. Kang.** 1986. Reduced reproduction of wedge-tailed shearwaters exposed to weathered Santa Barbara crude oil. *Arch. Environ. Contam. Toxicol.* **15**(4):453-463.

Keywords : reproduction, weathered, Santa Barbara crude oil, crude oil, dosed, eggs, behavior, survival, chicks, salt water, Oone, long-term, bird

[ Breeding wedge-tailed shearwaters dosed with Santa Barbara crude oil were evaluated for effects on reproduction; egg production, behavior, survival of chicks, return of breeders in second year.]

**Furness, R. W.** 1989. Declining seabird populations. *J. Zool. Lond.* **219**(1):177-180.

Keywords : decline, population, salt water, survey, bird, England, Ireland, Oone, growth

[ After decades of general seabird population increase around Britain and Ireland, the first indications of tapering off of growth and a few population declines were observed during a 1985-88 survey.]

**Furness, R. W. and C. J. Camphuysen.** 1997. Seabirds as monitors of the marine environment. *ICES J. Mar. Sci.* **54**(7):726-737.

Keywords : condition, beached bird survey, bird, survey, estimate, fingerprinting, monitoring, Oone, salt water, marine environment, petroleum

[ Evaluation of the use of seabirds as monitors of conditions in the marine environment. Section on the use of seabirds in beached bird surveys to estimate changes in the amount of oil pollution and to provide samples of petroleum for fingerprinting analysis.]

**Gabche, C. E., J. Folack, and G. C. Yongbi.** 1998. Tar ball levels on some beaches in Cameroon. *Mar. Pollut. Bull.* **36**(7):535-539.

Keywords : tar ball, beach, density, coast, Cameroon, Oten, salt water, miscellaneous

[ Measured tar ball density on one industrial, one tourist, and one reference beach along the coast of Cameroon. Collections made once a month for 12 consecutive mos.]

**Gallego, A., L. H. Cargill, M. R. Heath, S. J. Hay, and T. Knutsen.** 1995. An assessment of the immediate effect of the *Braer* oil-spill on the growth of herring larvae using otolith microstructure analysis. *Marine Pollut. Bull.* **30**(8):536-542.

Keywords : growth, herring, larvae, spill, Shetland, crude oil, fish, Othree, salt water

[ Assessment of the growth of herring larvae following the *Braer* spill near the Shetland Islands; otolith microstructure analysis.]

**Gandini, P., P. D. Boersma, E. Frere, M. Gandini, T. Holik, and V. Lichtschein.** 1994.

Magellanic penguins (*Spheniscus magellanicus*) affected by chronic petroleum pollution along coast of Chubut, Argentina. *The Auk* **111**(1):20-27.

Keywords : penguin, Argentina, carcass, beach, survey, salt water, Oone, oiled, bird, oiling

[ Several carcass counts along beaches of Argentina. Incidence of oiling noted.]

**Ganning, B., D. Broman, and C. Lindblad.** 1983. Uptake of petroleum hydrocarbons by the blue mussel (*Mytilus edulis* L.) after experimental oiling and high pressure, hot water shore cleaning. *Mar. Environ. Res.* **10**():245-254.

Keywords : uptake, petroleum hydrocarbons, hydrocarbons, mussel, oiling, pressure, water, cleaning, shoreline, crude oil, weathered, tissue, saturated hydrocarbons, aromatic hydrocarbons, concentration, dissolved, salt water, Ofour, marine invertebrate

[ Effect of shoreline cleaning on the uptake of petroleum by blue mussels in shallow near-shore water. Russian crude oil (weathered for 3 wks) was sprayed on the shoreline, half was permitted to clean naturally, and the other half was cleaned with high-pressure hot-water cleaning equipment. Mussels were placed in suspended bags at distances of 3 and 8 m from shore . Mussels were sampled for hydrocarbon analysis at 3 and 14 da after cleaning. Tissue analyzed for saturated hydrocarbons and light aromatics. A supplemental study measured the uptake from a known concentration of 'dissolved' crude oil.]

**Garrett, R. M., I. J. Pickering, C. E. Haith, and R. C. Prince.** 1998. Photooxidation of crude oils. *Environ. Sci. Technol.* **32**(23):3719-3723.

Keywords : crude oil, North Slope, Forties Field crude oil, composition, biodegradation, photooxidation, weathered, Oten, miscellaneous

[ Assessment of the effects of photooxidation on three weathered crude oils (North Slope, Forties, Gullfaks). Oil films and slicks were irradiated by a UV source for 48 hrs. Measured composition of crude before and after irradiation and compared results with reported results of biodegradation.]

**Garrity, S. D. and S. C. Levings.** 1990. Effects of an oil spill on the gastropods of a tropical intertidal reef flat. *Mar. Environ. Res.* **30**():119-153.

Keywords : spill, gastropod, intertidal, crude oil, population, habitat, monitoring, abundance, density, snail, species, salt water, Ofour, marine invertebrate

[ Assessment of the effect of a spill of medium weight crude oil on gastropods of a reef flat. Gastropod populations were monitored in six habitats within the reef flat; pre-spill monitoring occurred 1982-83 and post spill monitoring occurred for 3 years after the 1986 spill. Measured abundance of live and dead snails, number of species, temporal changes in snail size frequencies, and episodes of recruitment.]

**Garrott, R. A., L. L. Eberhardt, and D. M. Burn.** 1993. Mortality of sea otters in Prince William sound following the *Exxon Valdez* oil spill. *Marine Mammal Soc.* **9**(4):343-359.

Keywords : sea otter, Prince William Sound, Exxon Valdez, spill, numbers, Prudhoe Bay crude oil, crude oil, estimate, mammal, salt water, Otwo

[ Estimation of the numbers of sea otters killed by the Exxon Valdez oil spill.]

**Garshelis, D. L.** 1997. Sea otter mortality estimated from carcasses collected after the *Exxon Valdez* oil spill. *Conserv. Biol.* **11**(4):905-916.

Keywords : sea otter, carcass, Exxon Valdez, spill, estimate, numbers, beach, crude oil, search effort, Otwo, mammal, salt water

[ Estimate of numbers of sea otters killed during the Exxon Valdez oil spill. Author included information on proportion of dying otters that hauled out onto beaches, carcasses recovered at sea, and differences in search effort in different areas of the spill.]

**Garshelis, D. L. and J. A. Estes.** 1997. Sea otter mortality from the *Exxon Valdez* oil spill: evaluation of an estimate from boat-based surveys. *Mar. Mamm. Sci.* **13**(2):341-351.

Keywords : sea otter, Exxon Valdez, spill, estimate, survey, critique, methods, crude oil, Otwo, mammal, salt water

[ A critique of the estimate of sea otter deaths related to the Exxon Valdez oil spill made by Garrott et.al. (1993). Authors criticize the use of inadequate boat-based survey data and make several suggestions for other methods to be used after a major oil spill.]

**Gashev, S. N.** 1992. Effect of oil spills on the fauna and ecology of small mammals from the Central Ob' region. *Soviet J. Ecol.* **23**(2):99-106.

Keywords : spill, mammal, Otwo, organ, oilfield, fresh water, species, abundance, crude oil, freshwater plant, soil, region, USSR, activity, diversity

[ Effects on small mammals of contamination from oil production activities in the Central Ob' region of the USSR. Small mammal diversity and abundance, organ indices, and reproductive activity were measured.]

**Geiszler, P. C., B. J. Grantham, and G. J. Blomquist.** 1977. Fate of labeled n-alkanes in the blue crab and striped mullet. *Bull. Environ. Contam. Toxicol.* **17**(4):463-467.

Keywords : fate, uptake, metabolism, depuration, alkane, blue crab, striped mullet, fish, Othree, salt water, marine invertebrate, crab, mullet

[ Uptake and fate of two n-alkanes by the blue crab and striped mullet.]

**George, S. G., J. Wright, and J. Conroy.** 1995. Temporal studies of the impact of the Braer oilspill on inshore feral fish from Shetland, Scotland. *Arch. Environ. Contam. Toxicol.* **29**(4):530-534.

Keywords : fish, Shetland, Othree, species, petroleum hydrocarbons, salt water, spill, crude oil, metabolism, concentration, aromatic, petroleum, hydrocarbons, activity

[ Temporal assessment of exposure of several species of fish to petroleum hydrocarbons from the Braer oil spill near the Shetland Islands; mixed-function oxygenase activity for 7 months following the spill.]

**George-Ares, A., J. R. Clark, G. R. Biddinger, and M. L. Hinman.** 1999. Comparison of test methods and early toxicity characterization for five dispersants. *Ecotox. Environ. Safety*

**42(2):138-142.**

Keywords : toxicity, dispersant, acute, Corexit 9527, survival, concentration, rank, ODFour, salt water, marine invertebrate

[ The acute toxicities of Corexit 9527 and four experimental dispersant formulations were determined with the 96-hr mysid test, the Mysid IQ Toxicity Test, and Microtox. Survival was measured at 3, 6, 9, 12, 24, 48, 72, and 96 hr at nominal concentrations of 6.25 and 12.5 mg/liter in the 96-hr test.

Nominal concentrations were 6.25 to 100 mg/liter for the IQ Test and 12.5 to 100 mg/liter for Microtox. LC50s were calculated and toxicities ranked.]

**Geraci, J. R. and T. G. Smith.** 1976. Direct and indirect effects of oil on ringed seals (*Phoca hispida*) of the Beaufort Sea. J. Fish. Res. Board Can. **33**(1976-1984).

Keywords : seals, species, ingestion, crude oil, mammal, skin, physiology, population, Otwo, salt water, Canada, acute

[ Two species of seals were exposed, by immersion or ingestion, to Norman Wells crude oil to simulate acute exposure to spilled oil. Work was done in anticipation of oil exploration in the Beaufort Sea.]

**Geraci, J. R. and D. J. St.Aubin.** 1980. Offshore petroleum resource development and marine mammals: a review and research recommendations. Marine Fish. Rev. **42**(11):1-12.

Keywords : development, mammal, review, research, oilfield, behavior, physiology, pathology, salt water, Otwo, mitigation

[ A discussion and evaluation of the effects of all aspects of offshore oil development on marine mammals. Contains recommendations for mitigation actions and identifies topics for research.]

**Giam, C.-S., H. S. Chan, and G. S. Neff.** 1976. Distribution of *n*-paraffins in selected marine benthic organisms. Bull. Environ. Contam. Toxicol. **16**(1):37-43.

Keywords : Othree, marine invertebrate, paraffin, shrimp, squid, species, fish, Texas, salt water, petroleum hydrocarbons, baseline

[ Baseline study of paraffin content of shrimp, squid, and several species of marine fish from offshore Texas.]

**Gibson, M. J.** 1990. Results of the eagle capture, health assessment, and short-term rehabilitation program following the Valdez oil spill. Wildl. J. **13**(3):49-57.

Keywords : rehabilitation, spill, bald eagle, crude oil, Prudhoe Bay crude oil, capture, salt water, Oone, Alaska, bird, Exxon Valdez

[ Capture, health assessment, and rehabilitation of bald eagles after the Exxon Valdez oil spill.]

**Giere, O.** 1980. The impact of crude oil and oil dispersants on the marine oligochaete *Marionina subterranea*. Cahiers De Biologie Marine **21**(1):51-60.

Keywords : crude oil, dispersant, Arabian Light crude oil, concentration, temperature, static, combination, survival, oligochaete, ODFour, salt water, marine invertebrate

[ Assesment of the effects of Arabian Light crude oil and several chemical dispersants on a species of marine oligochaete. Tested a component of "old-type" dispersants at concentrations of 1-10 ppm and at two temperatures for 14 da in static tests; followed by addition of oil and only one temperature.



Three "modern" dispersants alone, in combination, or combined with crude oil at concentrations of 50-1000 ppm and one temperature for 14 da. Measured survival of oligochaetes.]

**Gilbert, F., L. Rivet, and J. Bertrand.** 1994. The in vitro influence of the burrowing polychaete *Nereis diversicolor* on the fate of petroleum hydrocarbons in marine sediments. *Chemosphere* **29**(1):1-12.

Keywords : polychaete, petroleum hydrocarbons, hydrocarbons, sediment, Arabian Light crude oil, crude oil, flow-through, oligochaete, concentration, saturated hydrocarbons, salt water, Ofour, marine invertebrate

[ Determination of the effect of a species of marine polychaete on the fate of Arabian Light crude oil. Polychaetes added to sediment with or without crude oil for 45 da in a flow-through system. Measured mixing of sediments by oligochaetes and concentrations of saturated hydrocarbons at varying depths within the sediment containers. Discusses the influence of oligochaetes in the disposition of oil in sediments.]

**Gilfillan, E. S., D. Mayo, S. Hanson, D. Donovan, and L. C. Jiang.** 1976. Reduction in carbon flux in *Mya arenaria* caused by a spill of No. 6 fuel oil. *Mar. Biol.* **37**(2):115-123.

Keywords : carbon, spill, No.6 fuel oil, fuel oil, Maine, clam, bivalve, rate, respiration, temperature, salinity, chlorophyll, petroleum hydrocarbons, concentration, tissue, sediment, filtration, assimilation, salt water, Ofour, marine invertebrate, shell, estimate, annual, petroleum

[ Assessment of the effects of a No. 6 fuel oil spill in Casco Bay, Maine on carbon flow in soft shell clams. Sampled clams at a contaminated and an uncontaminated site on a monthly basis from Nov. 1972 to Nov. 1973. Clams transported to a laboratory where rates of respiration, assimilation, and filtration were determined. Monthly estimates of carbons flow were calculated. Also measured annual cycle of seawater temperature, salinity, chlorophyll *a*, and petroleum concentrations in clam tissue and sediment.]

**Gill, D. A.** 1994. Environmental disaster and fishery co-management in a natural resource community: impacts of the *Exxon Valdez* oil spill. C. L. Dyer and J. R. McGoodwin (eds.), *Folk Management in the World's Fisheries*, pp.207-235. University Press of Colorado, Boulder.

Keywords : humans, Exxon Valdez, spill, crude oil, commercial fishing, society, economy, Othree, salt water, fishing, fish, disruption, structure

[ Assessment of the disruption of commercial fishing caused by the Exxon Valdez oil spill; consequences to fishermen and their social and economic structures.]

**Glegg, G. A., L. Hickman, and S. J. Rowland.** 1999. Contamination of limpets (*Patella vulgata*) following the *Sea Empress* oil spill. *Mar. Pollut. Bull.* **38**(2):119-125.

Keywords : limpet, spill, tanker, crude oil, fuel oil, England, naphthalene, phenanthrene, Shetland, aromatic hydrocarbons, time, salt water, Ofour, marine invertebrate

[ Limpets were sampled 2 wk, 4 mos, and 7 mos after the grounding of the *Sea Empress* oil tanker near Milford Haven, England in February 1996. Limpets were collected at four sites and analyzed for naphthalenes and phenanthrenes. Results were compared to the results from a similar evaluation performed after the *Braer* oil spill off the coast of Shetland in 1993. An effort was made to identify the

source of the hydrocarbons.]

**Glegg, G. A. and S. J. Rowland.** 1996. The *Braer* oil spill -- hydrocarbon concentrations in intertidal organisms. *Mar. Pollut. Bull.* **32**(6):486-492.

Keywords : spill, concentration, intertidal, aromatic hydrocarbons, bivalve, species, Shetland, tissue, salt water, Ofour, marine invertebrate

[ Determination of the concentrations of selected aromatic hydrocarbons in two bivalve species collected at five locations near the site of the *Braer* oil spill in Shetland, British Isles. Bivalves sampled at 1 wk, 3 mo, 6 mo, and 15 mo post spill. Tissue analyzed for 4-6 selected mono, di, and triaromatics.]

**Gochfeld, M.** 1979. Prevalence of oiled plumage of terns and skimmers on western Long Island, New York: baseline data prior to petroleum exploration. *Environ. Pollut.* **20**(2):123-129.

Keywords : oiled, plumage, tern, New York, skimmer, salt water, Oone, bird, oiling

[ Incidence of plumage oiling for common terns and black skimmers in colonies on western Long Island.]

**Goethe, F.** 1968. The effects of oil pollution on populations of marine and coastal birds. *Helgolander wiss. Meeresunters.* **17**():370-374.

Keywords : population, bird, spill, Europe, crude oil, refined oil, salt water, Oone

[ General comments and several specific descriptions of oil spills in western Europe.]

**Goksoyr, A., T. S. Solberg, and B. Serigstad.** 1991. Immunochemical detection of cytochrome P450IA1 induction in cod larvae and juveniles exposed to a water soluble fraction of North Sea crude oil. *Marine Pollut. Bull.* **22**(3):122-127.

Keywords : cod, larvae, fish, Othree, North Sea crude oil, crude oil, mixed-function oxidase, eggs, concentration, juvenile, metabolism, salt water, North Sea

[ Mixed-function oxidase response of cod eggs, larvae, and juveniles to variable concentrations of the water-soluble fraction of North Sea crude oil; exposure for 1 to 6 weeks.]

**Gold-Bouchot, G., R. Sima-Alvarez, O. Zapata-Perez, and J. Guemez-Ricalde.** 1995.

Histopathological effects of petroleum hydrocarbons and heavy metals on the American oyster (*Crassostrea virginica*) from Tabasco, Mexico. *Mar. Pollut. Bull.* **31**():4-12.

Keywords : petroleum hydrocarbons, hydrocarbons, metals, oyster, Mexico, tissue, salinity, Gulf of Mexico, weight, shell, length, condition, index, particulate, pathology, salt water, Ofour, marine invertebrate

[ Effort to relate histopathologic tissue lesions of oysters to contaminants and salinity at three coastal lagoons in the Mexican state of Tabasco (Gulf of Mexico). Collected oysters during Jun., Sept., and Nov. of 1992 and May of 1993. Measured soft tissue weight, shell length, and a condition index of oysters, as well as salinity at the collection site. Four classes of tissue examined for histologic lesions. Analyzed tissue for petroleum hydrocarbons, six metals, and particulate matter.]

**Gooday, G. W.** 1980. *Convoluta roscoffensis* and the *Amoco Cadiz* oil spill. *Mar. Pollut. Bull.*

**11()**:101-103.

Keywords : Amoco Cadiz, spill, crude oil, population, intertidal, beach, abundance, density, protein, biomass, salt water, Ofour, marine invertebrate

[ The populations of an intertidal flatworm at a beach affected by the Amoco Cadiz oil spill of 1978 were evaluated by comparing prespill (1976) data with postspill data (mid-1978). Measured abundance of colonies and species density within colonies at nine sites; one site was also characterized by measuring protein content, protein biomass, time of air exposure, and nearest spring tide.]

**Gordon, J. C.** 1929. No title (letter). Bird Notes and News **13()**:175

Keywords : bird, spill, Scotland, salt water, Oone

[ Report of bird deaths from an oil spill in Scotland.]

**Gorman, M. L. and C. E. Simms.** 1978. Lack of effect of ingested Forties Field crude oil on avian growth. Marine Pollut. Bull. **9()**:273-276.

Keywords : growth, chicks, duckling, herring gull, gull, crude oil, Forties Field crude oil, fresh water, Oone, bird, herring

[ Report of no effect on growth of chicks, ducklings, and herring gull chicks as a result of dosing with Forties Field crude oil.]

**Gorsline, J.** 1982. The effects of South Louisiana crude oil on adrenocortical function. Scanes CG, Ottinger MA, Kenny AD, Balthazart J, Cronshaw J, and Jones IC (eds.), Graduate Studies Texas Tech University. Aspects of Avian Endocrinology: Practical and Theoretical Implications, pp.359-364. Edition 26. Texas Tech Press. Lubbock, Texas.

Keywords : South Louisiana crude oil, crude oil, mallard, duck, bird, Oone, steroid, adrenal, biochemistry, physiology, mixed-function oxidase, Texas, fresh water, Louisiana, activity

[ Discussion of the effect of ingested South Louisiana crude oil on adrenocortical function and mixed function oxidase activity in mallard ducks.]

**Gorsline, J. and W. N. Holmes.** 1981. Effects of petroleum on adrenocortical activity and on hepatic naphthalene-metabolizing activity in mallard ducks. Arch. Environ. Toxicol. **10(6)**:765-777.

Keywords : mallard, ingestion, South Louisiana crude oil, crude oil, diet, physiology, fresh water, Oone, bird, Louisiana

[ Physiological effects of ingestion of South Louisiana crude oil in diet for periods up to 500 days.]

**Gorsline, J. and W. N. Holmes.** 1982. Adrenocortical function and hepatic naphthalene metabolism in mallard ducks (*Anas platyrhynchos*) consuming petroleum distillates. Environ. Res. **28(1)**:139-146.

Keywords : metabolism, mallard, South Louisiana crude oil, crude oil, diet, physiology, fresh water, Oone, bird, Louisiana, duck

[ Physiological effects of four distillate fractions of South Louisiana crude oil in the diet on mallard ducks.]

**Gorsline, J. and W. N. Holmes.** 1982. Ingestion of petroleum by breeding mallard ducks: some

effects on neonatal progeny. Arch. Environ. Contam. Toxicol. **11**(2):147-153.

Keywords : ingestion, mallard, crude oil, diet, duckling, female, South Louisiana crude oil, Prudhoe Bay crude oil, physiology, fresh water, Oone, bird, Louisiana, Prudhoe Bay

[ Physiological effects on breeding female mallards of South Louisiana and Prudhoe Bay crude oils in the diet; induction of similar physiological effects in ducklings.]

**Gorsline, J. and W. N. Holmes.** 1982. Suppression of adrenocortical activity in mallard ducks exposed to petroleum-contaminated food. Arch. Environ. Contam. Toxicol. **11**(4):497-502.

Keywords : mallard, fresh water, South Louisiana crude oil, crude oil, diet, physiology, Oone, bird, duck, Louisiana, activity

[ Physiological effects on mallard ducks of South Louisiana crude oil in the diet; suppression of adrenocortical activity.]

**Gorsline, J. and W. N. Holmes.** 1982. Variations with age in the adrenocortical responses of mallard ducks (*Anas platyrhynchos*) consuming petroleum-contaminated food. Bull. Environ. Contam. Toxicol. **29**(1):146-152.

Keywords : age, mallard, fresh water, South Louisiana crude oil, crude oil, diet, physiology, Oone, bird, Louisiana

[ Physiological effects on mallards of different ages (all less than 1 year) of South Louisiana crude oil in the diet; adrenocortical response.]

**Gorsline, J., W. N. Holmes, and J. Cronshaw.** 1981. The effects of ingested petroleum on the naphthalene-metabolizing properties of liver tissue in seawater-adapted mallard ducks (*anas platyrhynchos*). Environ. Res. **24**(2):377-390.

Keywords : mallard, diet, Santa Barbara crude oil, crude oil, South Louisiana crude oil, Kuwait crude oil, liver, Prudhoe Bay crude oil, salt water, Oone, bird, Louisiana, Kuwait, Prudhoe Bay

[ Effects on liver of mallards receiving diets containing South Louisiana, Kuwait, Prudhoe Bay, or two types of Santa Barbara crude oil for 50 days.]

**Graham, R. J. and T. C. Dorris.** 1968. Long-term toxicity bioassay of oil refinery effluents. Water Res. **2**(6):643-663.

Keywords : long-term, toxicity, refinery, effluent, survival, fathead minnow, fish, Othree, fresh water, flow-through

[ Toxicity assessment (survival) of four oil refinery effluents, using fathead minnows, flow-through bioassays, and exposure periods of 4 days and 32 days.]

**Gramentz, D.** 1988. Involvement of loggerhead turtle with the plastic, metal, and hydrocarbon pollution in the central Mediterranean. Marine Pollut. Bull. **19**(1):11-13.

Keywords : turtle, metals, spill, plastic, litter, Mediterranean, Othree, salt water, reptile

[ Examination of 99 loggerhead turtles caught by fishermen near the island of Malta for evidence of exposure to oil and plastic and metal litter.]

**Granby, K. and N. H. Spliid.** 1995. Hydrocarbons and organochlorines in common mussels from the

Kattegat and the Belts and their relation to condition indices. *Mar. Pollut. Bull.* **30**(1):74-82.

Keywords : hydrocarbons, organochlorines, mussel, condition, index, Denmark, North Sea, petroleum hydrocarbons, shell, length, weight, tissue, saturated hydrocarbons, aromatic hydrocarbons, salt water, Ofour, marine invertebrate

[ Common mussels were sampled at 26 sites in the waters east of Denmark (Baltic & North Sea interface) and analyzed for petroleum hydrocarbons and organochlorine compounds. Measured shell length, dry weight of tissue, lipid content, saturated hydrocarbons, aromatic hydrocarbons, chlorinated hydrocarbons, and calculated a condition index.]

**Grassle, J. F., R. Elmgren, and J. P. Grassle.** 1981. Response of benthic communities in MERL experimental ecosystems to low level, chronic additions of No. 2 fuel oil. *Mar. Environ. Res.* **4**(4):279-297.

Keywords : benthic, community, ecosystem, chronic, fuel oil, No.2 fuel oil, sediment, macrofauna, recovery, density, species, concentration, petroleum hydrocarbons

[ Effects on sediment macrofauna and meiofauna of chronic exposure to No. 2 fuel oil was determined through the use of experimental marine ecosystems. Oil-water dispersions were added periodically to the water over a 25 wk period followed by an 8 wk recovery period. Measured density of macrofauna and meiofauna species and concentration of petroleum hydrocarbons in water and sediment.]

**Grau, C. R., T. Roudybush, J. Dobbs, and J. Wathen.** 1977. Altered yolk structure and reduced hatchability of eggs from birds fed single doses of petroleum oils. *Science* **195**(4280):779-781.

Keywords : hatchability, eggs, bird, Japanese quail, Canada geese, chicken, crude oil, Bunker C, fuel oil, South Louisiana crude oil, Kuwait crude oil, fresh water, Oone, egg yolk, quail, Canada, Louisiana, Kuwait

[ Report of the effects on yolk deposition in Japanese quail, Canada geese, and chickens of single oral doses of South Louisiana and Kuwait crude oils, Bunker C fuel oil, or No. 2 fuel oil.]

**Gray, J. S., K. R. Clarke, R. M. Warwick, and G. Hobbs.** 1990. Detection of initial effects of pollution on marine benthos: an example from the Ekofisk and Eldfisk oilfields, North Sea. *Mar. Ecol. Prog. Ser.* **66**():285-299.

Keywords : detection, oilfield, North Sea, benthic, multivariate, species, Ofour, salt water, marine invertebrate

[ Effects of contamination from oil drilling platforms in two oilfields in the North Sea on marine benthic organisms. Established sampling transects radiating away from the oil platforms. Used multivariate techniques to detect changes caused by contamination. Applied technique to species and higher taxonomic groups.]

**Gregg, J. C., J. W. Fleeger, and K. R. Carman.** 1997. Effects of suspended, diesel-contaminated sediment on feeding rate in the darter goby, *Gobionellus boleosoma* (Teleostei: Gobiidae). *Marine Pollut. Bull.* **34**(4):269-275.

Keywords : sediment, estuarine, diesel fuel, fish, salt water, Othree, feeding

[ Effects of sediments contaminated with diesel fuel on feeding by a small bottom-feeding estuarine fish.]

**Gregory, D. G. and W. C. Edwards.** 1991. Investigating oiled birds from oil field waste pits. *Vet. Hum. Toxicol.* **33**(5):497-498.

Keywords : oiled, bird, waste oil, oilfield, Oklahoma, fresh water, Oone, oil field

[ Report of the the laboratory work supporting an investigation of deaths of birds in oil field waste pits in Oklahoma.]

**Griffin, L. F. and J. A. Calder.** 1977. Toxic effect of water-soluble fractions of crude, refined, and weathered oils on the growth of a marine bacterium. *Appl. Environ. Microbiol.* **33**(5):1092-1096.

Keywords : weathered, growth, bacteria, refined oil, concentration, aromatic hydrocarbons, crude oil, South Louisiana crude oil, Kuwait crude oil, No.2 fuel oil, Bunker C, Florida J crude oil

[ Evaluation of the toxic effect of water-soluble fractions of three crude and two refined oils to a marine bacterium in batch culture. One crude and one refined oil were 'weathered' and also tested on the bacterium. Measured bacterium growth and the concentration of selected aromatic hydrocarbons in the water-soluble fractions.]

**Griffiths, R. P., B. A. Caldwell, W. A. Broich, and R. Y. Morita.** 1982. Long-term effects of crude oil on microbial processes in subarctic marine sediments. *Studies on sediments amended with organic nutrients. Mar. Pollut. Bull.* **13**(8):273-278.

Keywords : crude oil, Alaska, sediment, organic, nutrients, Cook Inlet crude oil, microbes, salt water, Ofour, marine invertebrate

[ Effects of Cook Inlet crude oil on microbes in sediments amended with organic nutrients. Sediments collected from several sites in Kachemak Bay proper, amended with starch, cellulose, chitin, or seaweed and mixed with 50 ppt crude oil. Sediments returned to collection site and retrieved 6 or 8 mo later. Measured 11 or 13 microbial processes.]

**Griffiths, R. P., B. A. Caldwell, W. A. Broich, and R. Y. Morita.** 1982. The long-term effects of crude oil on microbial processes in subarctic marine sediments. *Estuarine Coastal Shelf Sci.* **15**():183-198.

Keywords : crude oil, sediment, Cook Inlet crude oil, microbes, experiment, weathered, time, salt water, Ofour, marine invertebrate, nitrogen

[ Assessment of the effects of Cook Inlet crude oil on microbes in sediment. Sediment collected from Kachemak Bay proper, mixed with 50 ppt crude oil, and used in several experiments. Some samples were returned to their site of collection and monitored for up to 18 mo. Other sediment was used to 'overlay' clean sediment and similarly returned to the collection site. Aquaria in a flowing seawater system were used for several experiments involving fresh and weathered crude oil for varying periods of time. Measured nitrogen fixation, denitrification, redox potential, CO<sub>2</sub> production, and methane production.]

**Griffiths, R. P., T. M. McNamara, B. A. Caldwell, and R. Y. Morita.** 1981. A field study on the acute effects of the dispersant Corexit 9527 on glucose uptake by marine microorganisms. *Mar. Environ. Res.* **5**(2):83-91.

Keywords : dispersant, Corexit 9527, Prudhoe Bay crude oil, crude oil, respiration, sediment,

concentration, glucose, uptake, water, salt water, ODFour, marine invertebrate

[ Assessment of the effects of Corexit 9527 alone or combined with Prudhoe Bay crude oil on glucose uptake or respiration by marine microorganisms in water and sediment. A total of 149 water and 95 sediment samples were collected and tested. Concentration of Corexit 9527 ranged from 0 to 100 ppm.]

**Groff, J. M., J. E. Blake, B. Rideout, R. Basaraba, and D. Wilson.** 1990. Necropsy observations in Alaskan sea otters (*Enhydra lutis*) from Prince William Sound affected by the Exxon Valdez oil spill. Anonymous. Annual Meeting of the International Association of Aquatic Animal Medicine, pp.31-32.

Keywords : necropsy, sea otter, Prince William Sound, Exxon Valdez, spill, rehabilitation, Alaska, Prudhoe Bay crude oil, crude oil, mammal, pathology, physiology, Otter, oiled, fur, salt water

[ Report of the necropsy results for 78 Alaskan sea otters killed by the Exxon Valdez spill or dying in rehabilitation centers.]

**Gross, A. O.** 1950. The herring gull - cormorant control project. Anonymous. Tenth International Ornithological Congress, pp.532-536.

Keywords : herring gull, gull, population, population control, New England, eggs, cormorant, oiled, salt water, Oone, bird, herring, England

[ Description of a population control project for herring gulls and cormorants in New England; use of a water-oil-formalin mixture sprayed on the eggs.]

**Gruger, E. H., Jr., M. M. Wekell, T. Numoto, and D. R. Craddock.** 1977. Induction of hepatic aryl hydrocarbon hydroxylase in salmon exposed to petroleum dissolved in seawater and to petroleum and polychlorinated biphenyls, separate and together, in food. Bull. Environ. Contam. Toxicol. **17**(5):512-520.

Keywords : Othree, food, Prudhoe Bay crude oil, crude oil, salt water, PCB, aryl hydrocarbon hydroxylase, metabolism, fish, hydrocarbons, salmon, Prudhoe Bay, water

[ Effects on induction of aryl hydrocarbon hydroxylase in coho salmon by exposure to Prudhoe Bay crude oil (dispersed or dissolved in water or incorporated in food); food incorporation was with or without PCBs.]

**Guillen, G. J. and D. Palafox.** 1985. The effects of weathered crude oil from the M/T Alvenus spill on eggs and yolk-sac larvae of red drum (*Sciaenops ocellatus*). Gulf Res. Rep. **8**(1):15-20.

Keywords : weathered, crude oil, spill, eggs, larvae, Venezuelan crude oil, concentration, survival, development, abnormalities, fish, Othree, salt water

[ Effects on red drum eggs and larvae of exposure to weathered Venezuelan crude oil from the M/T Alvenus spill. Experimental exposure for approximately 4 days to varying concentrations of the weathered oil followed by assessment of survival, development, and abnormalities.]

**Guiney, P. D., J. L. Sykora, and G. Keleti.** 1987. Qualitative and quantitative analyses of petroleum hydrocarbon concentrations in a trout stream contaminated by an aviation kerosene spill. Environ. Toxicol. Chem. **6**(2):105-114.

Keywords : petroleum hydrocarbons, Othree, concentration, stream, aviation kerosene, spill, fate, sediment, fish, species, fresh water, kerosene

[ Fate of aviation kerosene following a spill into a Pennsylvania stream; sediments sampled for 21 months, fish sampled for 7 months.]

**Gundersen, D. T., S. W. Kristanto, L. R. Curtis, S. N. Al-Yakoob, M. M. Metwally, and D. Al-Ajmi.** 1996. Subacute toxicity of the water-soluble fractions of Kuwait crude oil and partially combusted crude oil on *Menidia beryllina* and *Palaemonetes pugio*. Arch. Environ. Contam. Toxicol. **31**(1):1-8.

Keywords : toxicity, Kuwait crude oil, crude oil, fish, shrimp, Othree, growth, salt water, marine invertebrate, Gulf oil spill, species, Kuwait

[ Comparative toxicity to a fish and a shrimp species of the water-soluble fraction of Kuwait crude oil and partially combusted crude oil; prompted by the extensive oil fires during the Gulf War (1991). Tests were run for 16 days and growth was measured.]

**Gunkel, W.** 1968. Bacteriological investigations of oil-polluted sediments from the Cornish coast following the *Torrey Canyon* disaster. Anonymous. The Biological Effects of Oil Pollution on Littoral Communities, pp.151-158. Vol. Supplement, Vol. 2. Field Studies.

Keywords : sediment, coast, survey, microbes, spill, abundance, bacteria, salt water, Ofour, marine invertebrate, community

[ Survey of microbe presence in sediments of the Cornish coast after the Torrey Canyon oil spill. Twenty-three samples collected from seven locations. Measured the quantity of oil-decomposing and total bacteria. A preliminary study resulting in only general conclusions about the response of sediment bacteria to the presence of oil and oil emulsifiers.]

**Guzman, H. M., K. A. Burns, and J. B. C. Jackson.** 1994. Injury, regeneration and growth of Caribbean reef corals after a major oil spill in Panama. Mar. Ecol. Prog. Ser. **105**(3):231-241.

Keywords : injury, growth, Caribbean, coral reef, spill, Panama, long-term, crude oil, coast, behavior, residual oil, petroleum hydrocarbons, sediment, salt water, Ofour, marine invertebrate

[ Assessment of the long-term effects on reef corals of a large spill of crude oil on the Panamanian coast. The 1986 oil spill adversely affected intertidal mangroves, seagrass beds and reef flats. Authors conducted a 5-yr study of coral injury, regeneration, growth, behavior of residual oil, and petroleum hydrocarbons in sediment.]

**Guzman, H. M. and I. Holst.** 1993. Effects of chronic oil-sediment pollution on the reproduction of the Caribbean reef coral *Siderastrea siderea*. Mar. Pollut. Bull. **26**(5):276-282.

Keywords : chronic, reproduction, Caribbean, crude oil, spill, coral reef, oiled, injury, condition, salt water, Ofour, marine invertebrate

[ Assessment of the effect of a 1986 Panamanian crude oil spill on reproduction in a reef coral. The assessment was performed at four coral reefs, two oiled and two unoiled, between 39 and 54 mo post spill. Measured colony injury and size, and six characteristics of reproductive condition.]

**Gyllenberg, G. and G. Lundqvist.** 1976. Some effects of emulsifiers and oil on two copepod



species. Acta Zool. Fenn. **148**():1-24.

Keywords : copepod, species, static, flow-through, combination, crude oil, concentration, behavior, survival, oxygen, activity, respiration, salt water, Odfour, marine invertebrate

[ Assessment of the effects of two petroleum emulsifiers on two copepod species. Copepods were exposed in static and flow-through tests for up to 48 hr to emulsifiers alone or one emulsifier in combination with crude oil. Emulsifier concentrations varied from 10 to 10,000 ppm. Measured copepod behavior, survival, lipid content, oxygen consumption, and length of activity period.]

**Hadley, D.** 1977. Intra-and interspecific variability in tolerance of Southern California *Littorina planaxis* and *Littorina scutulata* to petroleum. Environ. Res. **13**(2):186-208.

Keywords : California, gasoline, kerosene, Santa Barbara crude oil, crude oil, Kuwait crude oil, Louisiana crude oil, species, gastropod, static, bioassay, survival, rate, recovery, salt water, Ofour, marine invertebrate

[ Effects of gasoline, kerosene, Santa Barbara crude oil, Kuwait crude oil and Louisiana crude oil on two species of marine gastropods (*Littorina* sp.). Gastropods had direct contact with oil followed by 6 hr in a static bioassay, washing, and then 7 da in a clean water static bioassay. Measured survival and attachment rates during the exposure and recovery periods.]

**Hagstrom, B. E. and S. Lonning.** 1977. The effects of Esso Corexit 9527 on the fertilizing capacity of spermatozoa. Mar. Pollut. Bull. **8**(6):136-138.

Keywords : Corexit 9527, dispersant, sea urchin, eggs, spermatozoa, fertilization, salt water, Odfour, marine invertebrate

[ Assessment of the effect of Corexit 9527 on sea urchin spermatozoa. Exposed spermatozoa to 0.0003 to 1.5 ppm Corexit 9527 for 2 to 40 hr. Measured the ability of the exposed spermatozoa to fertilize sea urchin eggs.]

**Haim, A., B. Nicolaisen, and N. A. Oritsland.** 1984. Crude oil -- its impact on the rat's heat balance. Comp. Biochem. Physiol. **78A**(2):259-261.

Keywords : crude oil, oxygen, temperature, rat, ingestion, fur, metabolism, mammal, Otwo, physiology, oiling

[ Effects on oxygen consumption (heat production) and body temperature of laboratory rats caused by either ingestion or fur oiling with crude oil.]

**Hall, A. J., J. Watkins, and L. Hiby.** 1996. The impact of the 1993 *Braer* oil spill on grey seals in Shetland. Sci. Total Environ. **186**(1-2):119-125.

Keywords : spill, seals, Shetland, North Sea crude oil, crude oil, physiology, respiration, mammal, salt water, Otwo, North Sea, tanker, coast

[ A report of respiratory distress in grey seals following the grounding of the tanker Braer (North Sea crude oil) off the coast Shetland, 1993.]

**Hall, R. J., A. A. Belisle, and L. Sileo.** 1983. Residues of petroleum hydrocarbons in tissues of sea turtles exposed to the Ixtoc I oil spill. J. Wildl. Dis. **19**(2):106-109.

Keywords : petroleum hydrocarbons, Othree, tissue, turtle, spill, necropsy, Texas, saturated

hydrocarbons, naphthalene, liver, kidney, salt water, crude oil, Mexico, pathology, reptile, coast, saturated, hydrocarbons

[ Necropsy performed on three sea turtles (two green and one ridley) found dead after the Ixtoc I oil reached the Texas coast. Necropsy results and analyses of saturated hydrocarbons plus naphthalene in liver and kidney of turtles.]

**Hansen, D. J.** 1981. The relative sensitivity of seabird populations in Alaska to oil pollution. Anonymous. pp.30 pages Tech. Paper #3. DOI, BLM, Alaska Outer Continental Shelf Office. Anchorage, AK.

Keywords : population, Alaska, vulnerability, spill, development, bird, species, salt water, Oone  
[ An assessment of the vulnerability of species and populations of Alaskan seabirds to potential oil spills caused by offshore oil and gas development.]

**Hansen, D. J.** 1985. The potential effects of oil spills and other chemical pollutants on marine mammals occurring in Alaskan waters. Anonymous. OCS Report, pp.i-ii, 1-21. MMS 85-0031. USDI, Minerals Management Service. Anchorage, AK.

Keywords : spill, mammal, salt water, species, Otwo, Alaska, physiology, pathology, reproduction, behavior, foraging, water  
[ Summary of the potential effects of oil and other chemicals on marine mammals in Alaskan waters.]

**Hansen, W. G., G. Bitton, J. L. Fox, and P. L. Brezonik.** 1977. Hydrocarbon status in Florida real estate canals. Mar. Pollut. Bull. **8**(3):57-62.

Keywords : Florida, petroleum, sediment, development, saturated hydrocarbons, bacteria, abundance, salt water, Ofour, marine invertebrate

[ Assessment of the presence of petroleum contamination in Florida real estate canals. Sediment samples collected at four coastal developments. Sediments analyzed for saturated hydrocarbons, aerobic bacteria, aerobic hydrocarbon-degrading aerobic bacteria, sulphate-reducing bacteria, and sulphate-reducing hydrocarbon degrading bacteria.]

**Hanson, H. S.** 1954. Criteria of age of incubated mallard, wood duck, and bob-white quail eggs. Auk **71**():267-272.

Keywords : age, mallard, eggs, embryo, development, wood duck, quail, Oone, duck, bird  
[ Descriptions of embryo development for mallard, wood duck, and bob-white quail; characteristics to assist with age determination.]

**Harfenist, A., A. P. Gilman, and K. L. Maus.** 1990. The effects of exposure of incubating adult and young herring gulls to a simulated No. 2 fuel oil slick. Arch. Environ. Contam. Toxicol. **19**():902-906.

Keywords : herring gull, gull, No.2 fuel oil, oil slick, incubation, chicks, survival, fresh water, Oone, bird, herring, fuel oil

[ Results of the exposure of nesting adult herring gulls (early and late-stage incubation) and chicks to simulated No 2 fuel oil slicks.]

**Hartung, R.** 1963. Ingestion of oil by waterfowl. Anonymous. Papers of the Michigan Academy of Science, Arts, and Letters, pp.49-55.

Keywords : ingestion, plumage, mallard, oiled, bird, quantity, Michigan, fresh water, Oone, viscosity, duck, necropsy

[ Application of low and high viscosity oils (unidentified) to plumage of mallard ducks. Resulted in first quantified demonstration of the ingestion of oil by oiled birds. Also, information on the amount of oil on dead oiled birds from the Detroit River and some necropsy information from dead oiled ducks.]

**Hartung, R.** 1965. Some effects of oiling on reproduction of ducks. J. Wildl. Manage. **29**(4):872-874.

Keywords : reproduction, ingestion, oiled, mallard, lubricating oil, mineral oil, fresh water, Oone, eggs, bird

[ Results on egg laying of dosing three mallards with unidentified lubricating oil and results of applying varying amounts of mineral oil on incubated eggs.]

**Hartung, R.** 1967. Energy metabolism in oil-covered ducks. J. Wildl. Manage. **31**(4):798-804.

Keywords : metabolism, mineral oil, mallard, black duck, diesel fuel, oiled, fresh water, Oone, bird, oiling, activity, duck

[ Effects of oiling with mineral oil or diesel oil on the metabolic activity of mallards and black ducks.]

**Hartung, R. and G. S. Hunt.** 1966. Toxicity of some oils to waterfowl. J. Wildl. Manage. **30**(3):564-570.

Keywords : mallard, black duck, dosed, fuel oil, spill, motor oil, cutting oil, pathology, fresh water, Oone, bird, duck, necropsy

[ Mallard and black ducks dosed with No. 1 fuel oil, diesel oil, motor oil, or cutting oil were assessed for pathological effects. Results were compared to the necropsy findings from a group of wild ducks killed by oil spills on the Detroit River.]

**Hartwick, E. B., R. S. S. Wu, and D. B. Parker.** 1982. Effects of a crude oil and an oil dispersant (Corexit 9527) on populations of the littleneck clam (*Protothaca staminea*). Mar. Environ. Res. **6**(4):291-306.

Keywords : crude oil, weathered, dispersant, Corexit 9527, population, clam, survival, activity, behavior, salt water, ODFour, marine invertebrate

[ Assessment of the effects of Corexit 9527 and a crude oil on the littleneck clam. Laboratory exposure consisted of either 100 ppm oil, 1000 ppm oil, 10 ppm Corexit, 100 ppm Corexit, 100 ppm oil plus 10 ppm Corexit, or 1000 ppm oil plus 100 ppm Corexit. Field exposure consisted of either 1000 ppm oil or 1000 ppm oil plus 100 ppm Corexit. Test solutions were taken daily from an outdoor weathering tank for 5 consecutive da. Measured survival, siphoning activities, larval settlement, and behavior.]

**Harty, B. and A. McLachlan.** 1982. Effects of water-soluble fractions of crude oil and dispersants on nitrate generation by sandy beach microfauna. Mar. Pollut. Bull. **13**(8):287-291.

Keywords : crude oil, dispersant, South Africa, nitrate, sandy beach, concentration, nitrogen, microbes, Arabian Light crude oil, salt water, ODFour, marine invertebrate, light, beach, ammonium

[ Assessment of the effects of Arabian Light crude oil and dispersants on nitrate generation by microfauna of sandy beaches. Samples of sand exposed for 20 or 40 hr to four water-soluble fraction concentrations, four dispersant concentrations, or five concentrations of dispersant plus WSF. Measured total nitrogen, ammonia, nitrite, and nitrate.]

**Harvey, S., J. G. Phillips, and P. J. Sharp.** 1982. Reproductive performance and endocrine responses to ingested North Sea oil. Scanes CG, Ottinger MA, Kenny AD, Balthazart J, Cronshaw J, and Jones IC (eds.), Graduate Studies Texas Tech University. Aspects of Avian Endocrinology: Practical and Theoretical Implications, pp.379-395. Edition 26. Texas Tech Press. Lubbock, Texas.

Keywords : endocrine, duck, diet, North Sea crude oil, crude oil, reproduction, hormone, biochemistry, bird, weight, Oone, fresh water, Texas, North Sea

[ Effects on Khaki Campbell ducks of ingested (diet) North Sea crude oil; reproduction, hormone production, biochemistry. An extensive discussion of the literature pertaining to ingested oil and birds.]

**Hawkes, J. W., E. H. Gruger, Jr., and O. P. Olson.** 1980. Effects of petroleum hydrocarbons and chlorinated biphenyls on the morphology of the intestine of chinook salmon (*Oncorhynchus tshawytscha*). Environ. Res. **23**(1):149-161.

Keywords : Othree, salt water, ingestion, diet, aromatic, aromatic hydrocarbons, chlorinated biphenyls, fish, pathology, intestine, salmon, hydrocarbons

[ Effects on intestinal mucosa of chinook salmon from ingestion of diets containing mixtures of chlorinated biphenyls, mixtures of aromatic hydrocarbons, or both mixtures; study lasted 49 days followed by histological evaluation.]

**Hawkes, J. W. and C. M. Stehr.** 1982. Cytopathology of the brain and retina of embryonic surf smelt (*Hypomesus pretiosus*) exposed to crude oil. Environ. Res. **27**(1):164-178.

Keywords : brain, crude oil, embryo, development, concentration, Cook Inlet crude oil, hatching, pathology, fish, salt water, retina, Othree

[ Exposure of surf smelt embryos at 6 days of development to two concentrations of the seawater-accomodated fraction of Cook Inlet crude oil for 21 and 27 days; hatching success and pathology of brain and retina.]

**Hayes, M. O. and J. Michel.** 1999. Factors determining the long-term persistence of *Exxon Valdez* oil in gravel beaches. Mar. Pollut. Bull. **38**(2):92-101.

Keywords : long-term, persistence, Exxon Valdez, beach, oiling, Prince William Sound, Alaska, survey, sediment, gravel, residual oil, Oten, salt water, miscellaneous

[ Assessment of the oiling of 6 intermittently exposed, coarse-grained gravel beaches in Prince William Sound, Alaska. Beaches surveyed from 1989 through summer of 1997. Beaches classified into two subclasses, those with well-established surface armor, flat slope, and thick layer of underlying sediment and (2) those with partial armor covering, steep slope, and thin layer of underlying sediment.]

**Hedtke, S. F. and F. A. Puglisi.** 1980. Effects of waste oil on the survival and reproduction of the American flagfish, *Jordanella floridae*. Can. J. Fish. Aquat. Sci. **37**(5):757-764.

Keywords : waste oil, survival, reproduction, crankcase oil, toxicity, larvae, growth, fish, fresh water, American flagfish, Othree, flagfish

[ Effects of waste crankcase oil on the survival and reproduction of the American flagfish; 4-day toxicity test, 30 day survival of 1-day old larvae, and a life cycle test. Measured survival and growth.]

**Hedtke, S. F. and F. A. Puglisi.** 1982. Short-term toxicity of five oils to four freshwater species. Arch. Environ. Contam. Toxicol. **11**(4):425-430.

Keywords : toxicity, species, fish, amphibian, crankcase oil, fuel oil, crude oil, emulsion, frog, salamander, Othree, fresh water, survival, static, flow-through

[ Toxicity tests on two species of fish, one species of frog, and one species of salamander with waste crankcase oil, No. 1 fuel oil, No. 2 fuel oil, and two crude oils. Tests run for 8 days with oils as floating layers, emulsions, and water-soluble fractions in static and flow-through tests.]

**Heintz, R. A., J. W. Short, and S. D. Rice.** 1999. Sensitivity of fish embryos to weathered crude oil: part II. Increased mortality of pink salmon (*Oncorhynchus gorbuscha*) embryos incubating downstream from weathered *Exxon Valdez* crude oil. Environ. Toxicol. Chem. **18**(3):494-503.

Keywords : fish, embryo, weathered, crude oil, pink salmon, Exxon Valdez, eggs, incubation, hatching, North Slope crude oil, sediment, survival, concentration, tissue, aromatic hydrocarbons, salt water, fresh water, Othree

[ Eggs of the pink salmon, throughout incubation and hatching, were exposed to Alaskan North Slope crude oil. Separate experiments employed direct contact of eggs with sediment contaminated by unweathered crude oil, eggs separated from the sediment by a barrier, and direct contact with sediment contaminated by weathered crude oil. Measured survival of embryos and PAH concentrations in gravel, water, and in fish tissue.]

**Hellou, J., J. F. Payne, C. Upshall, L. L. Fancey, and C. Hamilton.** 1994. Bioaccumulation of aromatic hydrocarbons from sediments: a dose-response study with flounder (*Pseudopleuronectes americanus*). Arch. Environ. Contam. Toxicol. **27**(4):477-485.

Keywords : Othree, aromatic hydrocarbons, hydrocarbons, sediment, concentration, Hibernia crude oil, crude oil, liver, muscle, salt water, fish, flounder, aromatic

[ Exposure of flounder to sediments containing varying concentrations of Hibernia crude oil for 4 months. Bioaccumulation of selected aromatic hydrocarbons was measured in the liver and muscle.]

**Hellou, J., C. Upshall, D. Taylor, P. O'Keefe, V. O'Malley, and T. Abrajano.** 1994. Unsaturated hydrocarbons in muscle and hepatopancreas of two crab species, *Chionoecetes opilio* and *Hyas coarctatus*. Mar. Pollut. Bull. **28**(8):482-488.

Keywords : aromatic hydrocarbons, muscle, hepatopancreas, crab, species, concentration, Newfoundland, Canada, sediment, salt water, Ofour, marine invertebrate

[ Determination of background concentrations of PAH in snow and spider crabs from nearshore Newfoundland. Concentrations of selected PAHs compared to the PAH content of sediments collected from Conception Bay. Measured PAHs in hepatopancreas and muscle.]

**Hellou, J., W. Warren, C. Andrews, G. Mercer, J. F. Payne, and D. Howse.** 1997. Long-term fate of crankcase oil in rainbow trout: a time- and dose-response study. *Environ. Toxicol. Chem.* **16**(6):1295-1303.

Keywords : waste oil, crankcase oil, dietary exposure, uptake, biochemical, rainbow trout, aromatic hydrocarbons, fish, fresh water, Othree

[ Dietary exposure of rainbow trout to crankcase oil. Measured uptake and biochemical responses.]

**Hellou, J. and W. G. Warren.** 1997. Polycyclic aromatic compounds and saturated hydrocarbons in tissues of flatfish: insight on environmental exposure. *Marine Environ. Res.* **43**(1/2):11-25.

Keywords : aromatic hydrocarbons, saturated hydrocarbons, hydrocarbons, tissue, liver, muscle, fish, Atlantic, Newfoundland, gonads, salt water, Othree, American plaice, yellowtail flounder, plaice, flounder, aromatic, saturated

[ Analysis of American plaice and yellowtail flounder for aromatic and saturated hydrocarbons in liver, muscle, and gonads. Fish collected from the northwest Atlantic near Newfoundland.]

**Henson, J. M. and S. S. Hayasaka.** 1982. Effects of the water-soluble fraction of microbiologically or physically altered crude petroleum on the heterotrophic activity of marine bacteria. *Mar. Environ. Res.* **6**(3):205-214.

Keywords : bacteria, Florida, crude oil, weathered, uptake, glutamate, microbes, emulsion, salt water, Ofour, marine invertebrate

[ Assessment of the comparative effects on marine bacteria of Florida crude oil emulsified or degraded by marine microorganisms; compared to fresh crude oil and artificially weathered crude oil.

Water-soluble fractions of oil emulsified or degraded for 3 or 8 da, or weathered for 42 da were used. Measured glutamate (labeled with <sup>14</sup>C) uptake by bacteria.]

**Heras, H., R. G. Ackman, and E. J. Macpherson.** 1992. Tainting of Atlantic salmon (*Salmo salar*) by petroleum hydrocarbons during a short-term exposure. *Marine Pollut. Bull.* **24**(6):310-315.

Keywords : Atlantic, Atlantic salmon, petroleum hydrocarbons, Othree, salt water, crude oil, fish, taint, aromatic hydrocarbons, liver, muscle, concentration, salmon, North Sea, aromatic, hydrocarbons

[ Exposure of young Atlantic salmon for 6 hours to the water-soluble fraction of Flotta North Sea crude oil; fish were killed and assessed for taint. Bioaccumulation of aromatic hydrocarbons in liver and muscle presented.]

**Herbert, R. and S. A. Poulet.** 1980. Effect of modification of particle size of emulsions of Venezuelan crude oil on feeding, survival and growth of marine zooplankton. *Mar. Environ. Res.* **4**(2):121-134.

Keywords : emulsion, Venezuelan crude oil, crude oil, Canada, feeding, survival, growth, zooplankton, ingestion, copepod, species, concentration, particulate, salt water, Ofour, marine invertebrate

[ Effect of oil particle size on ingestion by marine zooplankton (two copepods, one euphausiid).

Venezuelan crude oil and zooplankton collected from the St. Lawrence estuary. Measured particle size distribution occurring naturally and in artificially created emulsions, feeding response of two species to particle size, and growth and survival of one species exposed to a fixed concentration of oil.]

**Hermida Ameijeiras, A., J. Simal Gandara, J. Lopez Hernandez, and J. Simal Lozano.** 1994. Aliphatic hydrocarbon levels in farmed and free-living mussels from Galicia (N.W. Spain). *Marine Pollut. Bull.* **28**(3):178-181.

Keywords : aliphatic, hydrocarbons, mussel, Spain, farming, concentration, uptake, salt water, Ofour, marine invertebrate, fishing

[ Collection of free-living and farmed mussels from coastal northwest Spain (Galicia) for aliphatic hydrocarbon analysis; assessment of potential contamination due to shipping, fishing, and coastal industrialization.]

**Ho, C. L. and H. Karim.** 1978. Impact of adsorbed petroleum hydrocarbons on marine organisms. *Mar. Pollut. Bull.* **9**():156-162.

Keywords : petroleum hydrocarbons, oyster, larvae, sediment, experiment, uptake, alkane, spill, depuration, crude oil, salt water, Ofour, marine invertebrate

[ Assessment of the effect on oysters of petroleum adsorbed to sediments. Conducted experiments on adsorption potential of non-clay minerals, clay minerals, and two sediment mixtures. Measured uptake of alkanes from oily sediments after 1, 2, 4, and 6 wk. Measured alkane uptake from oil spill sites 2 wk and 5 mo after the spill. Compared 2 and 6 wk exposure followed by 2 wk depuration. Evaluated effect on larval settlement of crude oil coating on artificial surface.]

**Ho, K., L. Patton, J. S. Latimer, R. J. Pruell, M. Pelletier, R. McKinney, and S. Jayaraman.** 1999. The chemistry and toxicity of sediment affected by oil from the *North Cape* spilled into Rhode Island Sound. *Mar. Pollut. Bull.* **38**(4):314-323.

Keywords : toxicity, sediment, Rhode Island, concentration, petroleum hydrocarbons, spill, No.2 fuel oil, fuel oil, bivalve, embryo, larvae, bioassay, aromatic hydrocarbons, amphipod, degradation, Ofour, salt water, marine invertebrate

[ Determination of the concentration and toxicity of petroleum hydrocarbons in sediments of a semi-enclosed harbor area of Rhode Island Sound following a barge spill of No. 2 fuel oil. Water samples were taken on days 2, 2.5, 3, and 13 post spill and tested for toxicity with a bivalve embryo and larvae bioassay. Sediments were sampled on days 2, 6, 13, 33, 62, 132, 189, and 270 post spill, analyzed for aromatic hydrocarbons, and tested for toxicity with an amphipod bioassay. The pattern of natural degradation is shown.]

**Hodson, R. E., F. Azam, and R. F. Lee.** 1977. Effects of four oils on marine bacterial populations: controlled ecosystem pollution experiment. *Bull. Mar. Sci.* **27**(1):119-126.

Keywords : population, ecosystem, experiment, bacteria, Louisiana crude oil, crude oil, Kuwait crude oil, No.2 fuel oil, fuel oil, Bunker C, microbes, concentration, uptake, mineralization, glucose, salt water, Ofour, marine invertebrate

[ Assessment of the effect on marine bacteria of water extracts of Louisiana crude oil, Kuwait crude oil, No. 2 fuel oil, and Bunker C fuel oil. Field-collected microbes exposed to a range of concentrations of each oil extract for 30 da in "controlled ecosystem enclosures". Measured the uptake and mineralization of <sup>14</sup>C-labelled D-glucose and counted numbers of bacteria.]

**Hoffman, D. J.** 1978. Embryotoxic effects of crude oil in mallard ducks and chicks. *Toxicol. Appl.*

Pharmacol. **46**():183-190.

Keywords : crude oil, mallard, Oone, chicken, embryo, growth, development, South Louisiana crude oil, aliphatic, bird, shell, paraffin, Louisiana

[ Effects on mallard and chicken embryo growth and development from shell application of a paraffin mixture or several amounts of South Louisiana crude oil.]

**Hoffman, D. J.** 1979. Embryotoxic and teratogenic effects of petroleum hydrocarbons in mallards (*Anas platyrhynchos*). J. Toxicol. Environ. Health **5**():835-844.

Keywords : hydrocarbons, mallard, aliphatic, aromatic, crude oil, eggs, development, growth, Oone, embryo, bird

[ Applications of an aliphatic hydrocarbon mixture or several aromatic fractions found in crude oils were made to mallard eggs at 72 hr of development. Embryonic growth and development were evaluated in an effort to identify the most toxic components of crude oils.]

**Hoffman, D. J.** 1979. Embryotoxic and teratogenic effects of crude oil on mallard embryos on day one of development. Bull. Environ. Contam. Toxicol. **22**():632-637.

Keywords : crude oil, mallard, embryo, development, growth, eggs, egg shell, aliphatic, hydrocarbons, quantity, South Louisiana crude oil, incubation, Oone, bird, shell, hydrocarbon mixture, Louisiana

[ Growth and developmental effects on mallard embryos of applications to the egg shell of an aliphatic hydrocarbon mixture and several quantities of South Louisiana crude oil on day one of incubation.]

**Hoffman, D. J.** 1979. Embryotoxic effects of crude oil containing nickel and vanadium in mallards. Bull. Environ. Contam. Toxicol. **23**():203-206.

Keywords : crude oil, mallard, embryo, development, South Louisiana crude oil, growth, Oone, nickel, vanadium, bird, shell, Louisiana

[ Effects on mallard embryo development of shell application of South Louisiana crude oil with and without augmentation with vanadium and nickel.]

**Hoffman, D. J.** 1990. Embryotoxicity and teratogenicity of environmental contaminants to bird eggs. Rev. Environ. Contam. Toxicol. **115**():39-89.

Keywords : bird, eggs, review, embryo, biochemical, physiology, Oone, development, shell

[ Review of the effects on developing bird embryos of shell applications of a variety of environmental contaminants. Covers developmental and biochemical effects, residues in eggs, and field studies.]

**Hoffman, D. J. and P. H. Albers.** 1984. Evaluation of potential embryotoxicity and teratogenicity of 42 herbicides, insecticides, and petroleum contaminants to mallard eggs. Arch. Environ. Contam. Toxicol. **13**():15-27.

Keywords : petroleum, mallard, eggs, experiment, incubation, survival, development, malformation, pesticide, fresh water, Oone, bird

[ Presentation of the results of experiments on the embryotoxicity and teratogenicity of 29 pesticide and 13 petroleum substances. Fertile mallard eggs were exposed to tested substances early in incubation. Eggs were candled every other day and survivors were evaluated for survival and development on day



18 of incubation.]

**Hoffman, D. J. and W. C. Eastin, Jr.** 1981. Effects of industrial effluents, heavy metals, and organic solvents on mallard embryo development. *Toxicol. Letters* **9**():35-40.

Keywords : metals, mallard, embryo, development, incubation, industrial effluent, solvent, Oone, bird, shell, effluent, organic, petroleum

[ Effects on mallard embryos of shell application of seven industrial effluents and seven heavy metal, organic solvent, and petroleum solutions on days 3 and 8 of incubation.]

**Hoffman, D. J., W. C. Eastin, Jr., and M. L. Gay.** 1982. Embryotoxic and biochemical effects of waste crankcase oil on birds' eggs. *Toxicol. Appl. Pharmacol.* **63**():230-241.

Keywords : biochemical, crankcase oil, bird, eggs, mallard, quail, embryo, development, Oone, shell

[ Effects on mallard and quail embryos of shell applications of waste crankcase oil at 2 days of development.]

**Hoffman, D. J. and M. L. Gay.** 1981. Embryotoxic effects of benzo

[a]pyrene, chrysene, and 7,12-dimethylbenz

[a]anthracene in petroleum hydrocarbon mixtures in mallard ducks. *J. Toxicol. Environ. Health* **7**():775-787.

Keywords : Oone, mallard, embryo, aromatic, aromatic hydrocarbons, development, hydrocarbon mixture, bird, shell, hydrocarbons, petroleum

[ Effects on mallard embryos of shell application of three aromatic hydrocarbons added to a synthetic petroleum mixture at 3 days of development.]

**Hoffman, D. J. and J. M. Moore.** 1979. Teratogenic effects of external egg applications of methyl mercury in the mallard, *Anas platyrhynchos*. *Teratology* **20**(3):453-461.

Keywords : eggs, mallard, embryo, aliphatic, hydrocarbons, development, Oone, methyl mercury, bird, shell

[ Effects on mallard embryos of shell application of methyl mercury in an aliphatic hydrocarbon vehicle on day 3 of development.]

**Holcomb, J.** 1989. Alaskan oil spill bird rescue efforts. *Wildl. J.* **12**(1):3-13.

Keywords : spill, bird, rehabilitation, Exxon Valdez, mammal, Prudhoe Bay crude oil, Oone, salt water

[ Early report of the efforts to establish the animal rehabilitation facilities for the Alaskan oil spill (Exxon Valdez).]

**Hollaway, S. L., G. M. Faw, and R. K. Sizemore.** 1980. The bacterial community composition of an active oil field in the northwestern Gulf of Mexico. *Mar. Pollut. Bull.* **11**():153-156.

Keywords : community, composition, oil field, Gulf of Mexico, bacteria, abundance, biomass, sulfur, salt water, Ofour, marine invertebrate

[ Comparison of community composition of bacteria in an active offshore oil field with that of a control

site. Samples were collected during summer, fall, and winter at three locations (7.6 m, 1.6 km, and 3.2 km downcurrent) and at three depths (surface, 10 m, and 20 m). Measured bacterial abundance and biomass, classified major taxa, and measured percent of oil degrading and sulfur oxidizing bacteria.]

**Holmes, W. N.** 1982. Some common pollutants and their effects on steroid hormone-regulated mechanisms. Scanes CG, Ottinger MA, Kenny AD, Balthazart J, Cronshaw J, and Jones IC (eds.), Graduate Studies Texas Tech University. Aspects of Avian Endocrinology: Practical and Theoretical Implications, pp.365-370. Edition 26. Texas Tech Press. Lubbock, Texas.

Keywords : steroid, petroleum hydrocarbons, concentration, hormone, gonads, Oone, bird, biochemistry, physiology, Texas, petroleum, hydrocarbons

[ Discussion of potential for petroleum hydrocarbons to reduce production and circulating concentrations of gonadal steroid hormones.]

**Holmes, W. N. and K. P. Cavanaugh.** 1990. Some evidence for an effect of ingested petroleum on the fertility of the mallard drake (*Anas platyrhynchos*). Arch. Environ. Contam. Toxicol. **19**(6):898-901.

Keywords : mallard, female, South Louisiana crude oil, crude oil, diet, male, reproduction, fresh water, Oone, bird, Louisiana

[ Effects on gonadal function of male and female mallards fed South Louisiana crude oil in the diet for 100 days.]

**Holmes, W. N., K. P. Cavanaugh, and J. Cronshaw.** 1978. The effects of ingested petroleum on oviposition and some aspects of reproduction in experimental colonies of mallard ducks (*Anas platyrhynchos*). J. Reprod. Fert. **54**(3):335-347.

Keywords : reproduction, mallard, female, Kuwait crude oil, crude oil, diet, South Louisiana crude oil, fresh water, Oone, bird, Louisiana, Kuwait

[ Effects on reproductive function of female mallards fed South Louisiana or Kuwait crude oil in the diet for 100 days.]

**Holmes, W. N., J. Cronshaw, and J. Gorsline.** 1978. Some effects of ingested petroleum on seawater-adapted ducks (*Anas platyrhynchos*). Environ. Res. **17**(3):177-190.

Keywords : survival, mallard, diet, Kuwait crude oil, crude oil, fuel oil, No.2 fuel oil, South Louisiana crude oil, fresh water, salt water, Oone, stress, bird, Louisiana, Kuwait

[ Effects on survival of cold-stressed mallards fed diets containing South Louisiana or Kuwait crude oil, or No. 2 fuel oil.]

**Holmes, W. N., J. Gorsline, and J. Cronshaw.** 1979. Effects of mild cold stress on the survival of seawater-adapted mallard ducks (*Anas platyrhynchos*) maintained on food contaminated with petroleum. Environ. Res. **20**(4):425-444.

Keywords : survival, mallard, Oone, Santa Barbara crude oil, crude oil, No.2 fuel oil, diet, salt water, fresh water, South Louisiana crude oil, Prudhoe Bay crude oil, Kuwait crude oil, stress, bird, Louisiana, Kuwait, Prudhoe Bay, fuel oil

[ Effects on adrenocortical stimulation and survival of seawater-adapted and cold-stressed mallards fed

South Louisiana, Kuwait, Prudhoe Bay, or Santa Barbara crude oil, or No. 2 fuel oil in the diet for a 100-day experimental period.]

**Hose, J. E., J. B. Hannah, D. DiJulio, M. L. Landolt, B. S. Miller, W. T. Iwaoka, and S. P. Felton.** 1982. Effects of benzo(a)pyrene on early development of flatfish. Arch. Environ. Contam. Toxicol. **11**(2):167-171.

Keywords : development, larvae, species, concentration, survival, abnormalities, pathology, fish, Othree, salt water, sole

[ Larvae of three species of flatfish (sole) were exposed to varying concentrations of benzo(a)pyrene for 7 to 10 days; survival, abnormalities, and pathology.]

**Howard, S. and D. I. Little.** 1987. Effect of infaunal burrow structure on oil penetration into sediments. Anonymous. 1987 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.427-431. American Petroleum Institute. Washington, D.C.

Keywords : infauna, sediment, beach, England, oiled, lugworms, abundance, salt water, Ofour, marine invertebrate, spill, behavior

[ Assessment of the influence of infaunal burrow structures on penetration of oil into sediment. Beach plots in Milford Haven (England) were covered with oil mousse and compared to oiled sterile plots and controls. Measured lugworm casts, abundance of individuals in various taxonomic groups, and oil penetration into sediment.]

**Huesemann, M. H.** 1997. Land treating petroleum hydrocarbon-contaminated soils. P. N. Cheremisinoff (ed.), Ecological Issues and Environmental Impact Assessment, pp.237-261. Gulf Publishers, Houston, TX.

Keywords : soil, remediation, biodegradation, degradation, hydrocarbons, nutrients, Oten, microbes, miscellaneous, petroleum

[ Description of the steps involved in the remediation of soils contaminanted by petroleum; all actions are designed to understand the biodegradation potential and to maximize microbial degradation of petroleum compounds.]

**Hughes, J. B.** 1999. Cytological -- cytogenetic analyses of winter flounder embryos collected from the benthos at the barge *North Cape* oil spill. Mar. Pollut. Bull. **38**(1):30-35.

Keywords : winter flounder, flounder, embryo, spill, effects, heating oil, abnormalities, diesel, No.2 fuel oil, chromosome, pathology, population, fish, salt water, Othree

[ Effects of a spill of diesel and home heating oil in coastal Rhode Island from the barge *North Cape*. Embryos of winter flounder were collected from 22 sites near the spill. Embryos were assessed for morphological and chromosomal abnormalities; estimated the probable decline in the number of embryos surviving to the larval stage.]

**Hughes, M. R., C. Kasserra, and B. R. Thomas.** 1990. Effect of externally applied bunker fuel on body mass and temperature, plasma concentration, and water flux of glaucous-winged gulls, *Larus glaucescens*. Can. J. Zool. **68**(4):716-721.

Keywords : temperature, fresh water, gull, plumage, Bunker C, fuel oil, physiology, weight, Oone, bird,

blood, glaucous-winged gull, oiling

[ Effect on body mass, temperature, and blood chemistry of young glaucous-winged gulls subjected to plumage oiling with Bunker C fuel oil for 4-5 days.]

**Humphrey, B., P. D. Boehm, M. C. Hamilton, and R. J. Norstrom.** 1987. The fate of chemically dispersed and untreated crude oil in Arctic benthic biota. *Arctic* **40**(Suppl. 1):149-161.

Keywords : crude oil, Arctic, benthic, uptake, spill, Canada, beach, species, bivalve, sea urchin, aliphatic, aromatic hydrocarbons, tissue, dispersal, dispersant, salt water, ODFour, marine invertebrate

[ Assessment of the uptake by benthic biota of chemically dispersed and untreated crude oil from two experimental oil spills at Cape Hatt, N.W.T., Canada. One experimental spill was chemically dispersed, the other was released on the surface and allowed to strand on the beach. Four species of bivalve and one sea urchin were sampled from four bays at two sampling depths before the oil release, immediately after the release, 2-3 wk after releases, 1 yr after release, and 2 yr after release. Measured the aliphatic and aromatic hydrocarbon content of whole tissue.]

**Hunt, G. S.** 1961. Waterfowl losses on the lower Detroit River due to oil pollution. Anonymous. pp.10-26. Vol. Publ.No. 7. Great Lakes Research Division, Institute of Science and Technology, University of Michigan. Ann Arbor, MI.

Keywords : waterfowl, survival, spill, fresh water, Oone, history, bird, review, experiment

[ An account of losses of waterfowl due to oil pollution on the Detroit River, a literature review, eleven small experiments on the effects of oil on waterfowl, and management recommendations. A good historical reference to oil pollution in the 30s, 40s, and 50s.]

**Hunt, W. M., Jr. and J. G. Parks.** 1997. Regulatory approaches to oils under the federal Water Pollution Control Act and the Oil Pollution Act of 1990. Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.51-58. American Petroleum Institute. Washington, DC.

Keywords : review, history, petroleum, nonpetroleum oil, regulation, vegetable oil, Oten, miscellaneous, spill, coast

[ A review of the effects, definitions, and legislative history of petroleum and nonpetroleum oils as environmental contaminants. Discussion of the significance of nonpetroleum oils for the Coast Guard, EPA, and Dept. of Transportation.]

**Hurst, R. J. and N. A. Oritsland.** 1982. Polar bear thermoregulation: effect of oil on the insulative properties of fur. *J. Therm. Biol.* **7**(4):201-208.

Keywords : thermoregulation, fur, motor oil, crude oil, insulation, polar bear, Otwo, salt water, mammal, air

[ Effect of motor oil and two crude oils on the insulative properties of polar bear fur; fur from three bears, several types of air exposure, winter and summer.]

**Hurst, R. J., P. D. Watts, and N. A. Oritsland.** 1991. Metabolic compensation in oil-exposed polar bears. *J. Therm. Biol.* **16**(1):53-56.

Keywords : polar bear, thermoregulation, crude oil, respiration, insulation, physiology, oiling, fur, mammal, Otwo, salt water

[ Effects of experimental oiling on thermoregulation of polar bears; three bears, crude oil, respiration chamber, body transmitters.]

**Hyland, J., D. Hardin, M. Steinhauer, D. Coats, R. Green, and J. Neff.** 1994. Environmental impact of offshore oil development on the Outer Continental Shelf and slope off Point Arguello, California. *Mar. Environ. Res.* **37**(1):195-229.

Keywords : California, concentration, metals, petroleum hydrocarbons, sediment, abundance, benthic, drilling fluids, drilling mud, salt water, Ofour, marine invertebrate

[ Assessment of several effects of drilling platforms on the ocean floor off Southern California. Hard- and soft-bottom sites were sampled over a 4-yr period. Drilling sites were sampled before, during, and after initiation of drilling. Measured depositional flux, depositional pattern, concentrations of metals and petroleum hydrocarbons in sediments, and abundance of epifauna.]

**Hyland, J., D. Laur, J. Jones, J. Shrake, D. Cadian, and L. Harris.** 1994. Effects of an oil spill on the soft-bottom macrofauna of Arthur Harbour, Antarctica compared with long-term natural change. *Antarctic Sci.* **6**(1):37-44.

Keywords : Antarctic, spill, macrofauna, benthic, diesel fuel, numbers, species, sediment, unresolved complex mixture, aromatic hydrocarbons, population, community, salt water, Ofour, marine invertebrate

[ Evaluation of the effects on benthic macrofauna of a spill of diesel fuel in Arthur Harbor, Antarctica. Sampled four sites (two historical controls, one spill site, one spill control) 2 mo after the spill. Measured numbers of individuals, species, and families of macrofauna, sediment characteristics, total hydrocarbons, unresolved complex mixture, and PAHs.]

**Jackson, L., T. Bidleman, and W. Vernberg.** 1981. Influence of reproductive activity on toxicity of petroleum hydrocarbons to ghost crabs. *Mar. Pollut. Bull.* **12**(2):63-65.

Keywords : toxicity, petroleum hydrocarbons, crab, crude oil, Kuwait crude oil, flow-through, bioassay, survival, concentration, aromatic hydrocarbons, heart, muscle, gonads, eye, hepatopancreas, gill, Ofour, salt water, marine invertebrate

[ Assessment of the effect of crude oil on ghost crabs during reproductive and nonreproductive periods. Field-captured crabs were exposed to the water-soluble fraction of Kuwait crude oil in a flow-through bioassay for 96 hr. Crabs were captured in July, August, September, and October. Measured survival and concentration of aromatic hydrocarbons in exposure water, heart, muscle, gonad, eye, hepatopancreas, and gill.]

**Jackson, S.** 1993. The effects of oil pollution on seabirds. *Penguin Conserv.* **6**(3):4-9.

Keywords : bird, spill, population, physiology, salt water, Oone

[ A general account of the effects of oil on seabirds.]

**Jackson, W. A. and J. H. Pardue.** 1999. Potential for enhancement of biodegradation of crude oil in Louisiana salt marshes using nutrient amendments. *Water Air Soil Pollut.* **109**(1-4):343-355.

Keywords : biodegradation, crude oil, Louisiana, nutrients, South Louisiana crude oil, soil, rate, salt marsh, nitrogen, phosphorus, alkane, aromatic, salt water, Oten, miscellaneous, effects, Louisiana crude oil, experiment, degradation, aromatic hydrocarbons, hydrocarbons

[ Evaluation of the effects of nutrient enhancement on biodegradation of South Louisiana crude oil. One experiment performed in aquatic mesocosms (N and P used) and a second performed with intact cores of marsh soil and vegetation (N only). Loading rates and the best form of N were determined. Measured the degradation of selected alkane and aromatic hydrocarbons.]

**Jacobs, R. P. W. M.** 1980. Effects of the 'Amoco Cadiz' oil spill on the seagrass community at Roscoff with special reference to the benthic infauna. *Mar. Ecol. Prog. Ser.* **2**():207-212.

Keywords : Amoco Cadiz, spill, seagrass, community, benthic, infauna, crude oil, invertebrate, eelgrass, France, density, species, diversity, Ofour, salt water, marine invertebrate, marine plant

[ Evaluation of the effects of the Amoco Cadiz crude oil spill (March 1978) on the benthic invertebrates of an eelgrass bed off the coast of France. Upper and lower portions of the eelgrass bed were separately evaluated on a monthly basis during the period October 1977 to April 1979. Measured density of benthic individuals, species numbers and diversity.]

**Jacobsson, A. and E. Newman.** 1991. Fish recruitment around a petrochemical centre in the North Sea. *Marine Pollut. Bull.* **22**(6):269-272.

Keywords : fish, North Sea, species, abundance, Sweden, reproduction, population, refinery, Othree, salt water

[ Assessment of recruitment of two marine fish species near a petrochemical complex on coastal Sweden; abundance, size, and reproductive success measured.]

**Jayko, K., M. Reed, and A. Bowles.** 1990. Simulation of interactions between migrating whales and potential oil spills. *Environ. Pollut.* **63**(2):97-127.

Keywords : spill, development, model, salt water, simulation, whale, species, mammal, Otwo, Alaska, water

[ Development of a simulation model for migrating bowhead and gray whales in the presence of oil spills in Alaskan waters.]

**Jensen, K.** 1981. Levels of hydrocarbons in mussels, *Mytilus edulis*, and surface sediments from Danish coastal areas. *Bull. Environ. Contam. Toxicol.* **26**(2):202-206.

Keywords : mussel, sediment, concentration, petroleum hydrocarbons, Denmark, tissue, Ofour, salt water, marine invertebrate

[ Determination of the concentrations of petroleum hydrocarbons in blue mussels and sediments of coastal Denmark. Samples collected from 12 locations between January and May 1980. Measured total hydrocarbons in mussel tissue and sediments.]

**Jenssen, B. M.** 1989. Effects of ingested crude and dispersed crude oil on thermoregulation in ducks (*Anas platyrhynchos*). *Environ. Res.* **48**(1):49-56.

Keywords : crude oil, mallard, dispersant, ingestion, fresh water, ODone, temperature, bird,

thermoregulation, duck

[ Effects on thermoregulation in mallard ducks of doses of crude oil and chemically-dispersed crude oil.]

**Jenssen, B. M.** 1994. Review article: effects of oil pollution, chemically treated oil, and cleaning on the thermal balance of birds. *Environ. Pollut.* **86**(2):207-215.

Keywords : review, cleaning, bird, plumage, rehabilitation, physiology, temperature, dispersant, ODone, thermoregulation, oiling

[ A review of the effects on thermoregulation in birds of ingested oil and plumage oiling from dispersed and undispersed oil.]

**Jenssen, B. M.** 1996. An overview of exposure to, and effects of, petroleum oil and organochlorine pollution in Grey seals (*Halichoerus grypus*). *Sci. Total Environ.* **186**(1-2):109-118.

Keywords : petroleum, organochlorines, seals, review, population, sublethal, survival, Otwo, salt water, mammal

[ Review of the exposure to, and effects of, petroleum and organochlorines in grey seals throughout the world. Discussion of effects on individuals and consequences for populations.]

**Jenssen, B. M. and M. Ekker.** 1988. A method for evaluating the cleaning of oiled seabirds. *Wildl. Soc. Bull.* **16**(2):213-215.

Keywords : methods, cleaning, oiled, bird, temperature, rehabilitation, Oone, physiology, plumage

[ Description of a method to assess the success of cleaning of oiled birds; based on measured body temperature and heat production.]

**Jenssen, B. M. and M. Ekker.** 1989. Rehabilitation of oiled birds: a physiological evaluation of four cleaning agents. *Marine Pollut. Bull.* **20**(10):509-512.

Keywords : rehabilitation, oiled, bird, cleaning, plumage, physiology, Oone

[ An assessment of the ability of four cleaning agents to clean plumage and restore the natural insulative properties; use of a metabolic chamber.]

**Jenssen, B. M. and M. Ekker.** 1990. Effects of plumage oiling on thermoregulation in common eiders residing in air and in water. Anonymous. *Trans. 19th IUGB Congress*, pp.281-287. Trondheim, Norway.

Keywords : plumage, common eider, oiled, bird, physiology, temperature, Oone, water, crude oil, eiders

[ Comparison of the heat loss of oiled common eiders on water versus on land.]

**Jenssen, B. M. and M. Ekker.** 1991. Effects of plumage contamination with crude oil dispersant mixtures on thermoregulation in common eiders and mallards. *Arch. Environ. Contam. Toxicol.* **20**(3):398-403.

Keywords : plumage, crude oil, dispersant, common eider, mallard, physiology, temperature, ODone, bird, thermoregulation, eiders

[ A comparison of the effects on thermoregulation of mallards and common eiders of undispersed and chemically dispersed crude oil.]

**Jenssen, B. M. and M. Ekker.** 1991. Dose dependent effects of plumage-oiling on thermoregulation of common eiders *Somateria mollissima* residing in water. *Polar Res.* **10**(2):580-584.

Keywords : common eider, physiology, temperature, crude oil, Oone, plumage, bird, time, oiling, thermoregulation, eiders

[ Assessment of the time- and dose-dependent aspect of the effect of plumage oiling on thermoregulation in common eiders.]

**Jenssen, B. M., M. Ekker, and C. Bech.** 1985. Thermoregulation in a naturally oil-contaminated black-billed murre *Uria aalge*. *Bull. Environ. Contam. Toxicol.* **35**(1):9-14.

Keywords : temperature, oiled, plumage, bird, Oone, salt water, physiology, thermoregulation

[ Thermoregulation in a single naturally-oiled black-billed murre.]

**Jenssen, B. M., M. Ekker, and K. Zahlsen.** 1990. Effects of ingested crude oil on thyroid hormones and on the mixed function oxidase system in ducks. *Comp. Biochem. Physiol.* **95C**(2):213-216.

Keywords : crude oil, hormone, mallard, physiology, Oone, bird

[ Effects on thyroid hormones and the mixed function oxidase system of mallards as a result of dosing with crude oil.]

**Jenssen, B. M. and M. Staurnes.** 1989. Effects of oil on eggshell conductance. *Cmp. Biochem. Physiol.* **93C**(2):221-223.

Keywords : water, chicken, eggs, egg shell, crude oil, Oone, bird, shell

[ Effects on water vapor conductance of chicken egg shells receiving varied applications of crude oil.]

**Joensen, A. H.** 1972. Oil pollution and seabirds in Denmark 1935-1968. *Danish Rev. Game Biol.* **6**(8):1-24.

Keywords : Denmark, spill, oiled, bird, population, Oone, salt water, history

[ Historical account of oil spills and seabirds for Denmark during the period 1935-1968.]

**Johns, D. M. and J. A. Pechenik.** 1980. Influence of the water-accomodated fraction of No. 2 fuel oil on energetics of *Cancer irroratus* larvae. *Mar. Biol.* **55**():247-254.

Keywords : fuel oil, energetics, larvae, development, crab, survival, food, ingestion, weight, respiration, rate, growth, No.2 fuel oil, Ofour, salt water, marine invertebrate

[ Assessment of the effects of No. 2 fuel oil on larval development of the rock crab. Newly-hatched larvae were exposed to 0.1 ppm water-accomodated fraction of No. 2 fuel oil for the period of larval development (five stages) until the megalopa stage. Measured survival, food ingestion, dry weight at each developmental stage, respiration rate, and growth efficiency.]

**Johnson, S. W., M. G. Carls, R. P. Stone, C. C. Brodersen, and S. D. Rice.** 1997. Reproductive success of Pacific herring, *Clupea pallasi*, in Prince William Sound, Alaska, six years after the *Exxon*



Valdez oil spill. Fishery Bull. **95**():748-761.

Keywords : herring, Prince William Sound, Alaska, Exxon Valdez, spill, region, hatching, larvae, crude oil, abnormalities, swimming, Othree, salt water, fish, Pacific, Pacific herring

[ Assessment of reproductive performance of Pacific herring in Prince William Sound six years after the Exxon Valdez oil spill. Evaluated according to region (affected area vs unaffected area) and specific years. Measured percent hatching, percent viable larvae, percent effective swimmers, and percent larvae with spinal defects.]

**Jones, D. A., J. Plaza, I. Watt, and M. Al Sanei.** 1998. Long-term (1991-1995) monitoring of the intertidal biota of Saudi Arabia after the 1991 Gulf War oil spill. Mar. Pollut. Bull. **36**(6):472-489.

Keywords : long-term, monitoring, intertidal, spill, invertebrate, abundance, Arabian Gulf, species, season, plant, Ofour, salt water, marine invertebrate, marine plant, rocky shore, seasonal

[ Monitoring of the intertidal invertebrate and plant occurrence and abundance along permanent transect lines on the western shore of the Arabian Gulf from 1991 to 1995. Classified shore line as sand shores, rocky shores, or saltmarsh-mud shores, and also evaluated recruitment and seasonal changes in biota.]

**Jones, P. H., J.-Y. Monnat, C. J. Cadbury, and T. J. Stowe.** 1978. Birds oiled during the *AMOCO CADIZ* incident -- an interim report. Marine Pollut. Bull. **9**(11):307-310.

Keywords : bird, oiled, Amoco Cadiz, spill, France, crude oil, population, Oone, salt water, coast

[ An early report of seabird deaths from the Amoco Cadiz oil spill off the coast of France.]

**Jovancicevic, B., L. Tasic, H. Wehner, D. Markovic, and P. Polic.** 1998. *n*-alkane distribution as a tool in the identification of organic type pollution in river sediments. Fresenius Envir. Bull. **7**():320-326.

Keywords : organic, sediment, alkane, petroleum hydrocarbons, distribution, fresh water, Oten, miscellaneous

[ Authors attempt to contrast sediments from a sewage-polluted river with sediments from an unpolluted river through the use of *n*-alkane distributions. Purpose is to identify the source of the organic pollution.]

**Joyce, P.** 1998. Floating tar in the western North Atlantic and Caribbean Sea, 1982-1996. Mar. Pollut. Bull. **36**(2):167-171.

Keywords : Atlantic, tar ball, Caribbean, hydrocarbons, Oten, salt water, miscellaneous, density

[ Assessment of the density of floating tar balls in the western North Atlantic and Caribbean Sea during the years 1982-96.]

**Kaplan, I., S.-T. Lu, R. Lee, and G. Warrick.** 1996. Polycyclic hydrocarbon biomarkers confirm selective incorporation of petroleum in soil and kangaroo rat liver samples near an oil well blowout site in the western San Joaquin Valley, California. Environ. Toxicol. Chem. **15**(5):696-707.

Keywords : mammal, soil, rat, liver, California, crude oil, metabolism, degradation, alkane, aromatic,

terpane, sterane, Onine, biomarker, fresh water, technical, aromatic hydrocarbons, hydrocarbons

[ Description of the use of sterane and terpane compounds as chemical biomarkers indicative of crude oil contamination in soil and kangaroo rat livers. Useful because they are more resistant to metabolism and degradation than alkane and aromatic hydrocarbons.]

**Kasymov, A. G. and E. E. Velikhanov.** 1992. The joint effect of oil and drilling agents on some invertebrate species of the Caspian Sea. *Water Air Soil Pollut.* **62**(1-2):1-11.

Keywords : invertebrate, crude oil, shrimp, bivalve, concentration, drilling mud, Caspian Sea, survival, oxygen, weight, fertility, Ofour, salt water, marine invertebrate

[ Assessment of the effects of oil drilling agents and water-soluble fractions of crude oil separately or combined on invertebrates of the Caspian Sea. Exposed a shrimp and a bivalve to varying concentrations of three agents in drilling muds and several concentrations of WSF combined with the agents. Measured survival, oxygen consumption, and weight gain for all three agents. Also measured effect on fertility in the shrimp and survival of its offspring.]

**Keck, R. T., R. C. Heess, J. Wehmiller, and D. Maurer.** 1978. Sublethal effects of the water-soluble fraction of Nigerian crude oil on the juvenile hard clams, *Mercenaria mercenaria* (Linne). *Environ. Pollut.* **15**(2):109-119.

Keywords : sublethal, crude oil, Nigerian crude oil, juvenile, clam, depuration, concentration, experiment, rate, feeding, algae, growth, Ofour, salt water, marine invertebrate

[ Juvenile hard clams were exposed to Nigerian crude oil for 5 wk followed by a 2-wk depuration period. Clams were subjected to several concentrations of the water-soluble fraction in a 48-hr water-renewal experiment. Measured rate of feeding on algae and growth of clams.]

**Kendeigh, S. C.** 1969. Tolerance of cold and Bergmann's Rule. *The Auk* **86**():13-25.

Keywords : bird, temperature, Oone, metabolism, tolerance, relation

[ A comparison of cold tolerance between passerine and nonpasserine birds and the relation to Bergmann's Rule.]

**Kennicutt II, M. C. and S. T. Sweet.** 1992. Hydrocarbon contamination on the Antarctic peninsula: III. The *Bahia Paraiso* -- two years after the spill. *Mar. Pollut. Bull.* **25**():9-12.

Keywords : Antarctic, spill, diesel fuel, subtidal, sediment, limpet, concentration, aromatic hydrocarbons, beach, salt water, Ofour, marine invertebrate

[ Assessment of the environmental effects and remnants of a diesel fuel spill 2 yrs previous in Arthur Harbor, Antarctica. Subtidal sediment samples from 41 locations (2, 15, and 27 mo post spill) and samples of limpets from 20 locations (1, 2, 14, and 27 mo post spill) were analyzed for concentrations of aromatic hydrocarbons. Beach samples were also collected and analyzed for aromatic hydrocarbons in 1991.]

**Kerley, G. I. H., C. G. Crellin, and T. Erasmus.** 1987. Gravimetric determination of water-repellancy in rehabilitated oiled seabirds. *Marine Pollut. Bull.* **18**(11):609-611.

Keywords : oiled, cleaning, rehabilitation, bird, salt water, Oone, water

[ Recommendation for testing for water repellancy of rehabilitated birds before releasing into the wild.]

**Kerley, G. I. H. and T. Erasmus.** 1986. Oil pollution of Cape gannets: to clean or not to clean? Marine Pollut. Bull. **17**(11):498-500.

Keywords : cleaning, oiled, South Africa, Africa, rehabilitation, bird, Oone, salt water

[ An assessment of the utility of cleaning oiled Cape (South Africa) gannets.]

**Kerley, G. I. H. and T. Erasmus.** 1987. Cleaning and rehabilitation of oiled jackass penguins. S. African J. Wildl. Res. **17**(2):64-70.

Keywords : cleaning, rehabilitation, oiled, penguin, South Africa, bird, salt water, Oone, washing

[ An evaluation of two washing techniques for cleaning oiled jackass penguins.]

**Kerley, G. I. H. and T. Erasmus.** 1987. The management of oiled penguins. Anonymous. 1987 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.465-468. American Petroleum Institute. Washington, DC.

Keywords : oiled, penguin, rehabilitation, cleaning, salt water, Oone, South Africa, spill, behavior, bird, oiling

[ Discussion of the effects of oiling on South African penguins and the procedures for rehabilitation of oiled penguins.]

**Kerley, G. I. H., T. Erasmus, and R. P. Mason.** 1985. Effect of moult on crude oil load in a jackass penguin *Spheniscus demersus*. Marine Pollut. Bull. **16**(12):474-476.

Keywords : crude oil, penguin, oiled, plumage, moult, salt water, Oone, bird

[ Assessment of the effect of moult on loss of oil from oiled plumage.]

**Kertell, K. and R. L. Howard.** 1997. Impoundment productivity in the Prudhoe Bay Oil Field, Alaska: Implications for waterbirds. Environ. Manage. **21**(5):779-792.

Keywords : Prudhoe Bay, Alaska, oilfield, habitat, macroinvertebrate, chlorophyll, phosphorus, nitrogen, fresh water, bird, Oone, freshwater invertebrate, oil field, productivity

[ Comparison of natural ponds to impoundments caused by oilfield construction (roads, drilling pads) in the Prudhoe Bay oil field. Also evaluated differences among habitat types within impoundments and ponds. Measured macroinvertebrate productivity, chlorophyll *a*, phosphorus, and nitrogen. Study performed during summers of 1991-93.]

**Khan, A. A., R. W. Coppock, M. M. Schuler, L. Z. Florence, L. E. Lillie, and M. S. Mostrom.** 1996. Biochemical effects of Pembina Cardium crude oil in cattle. Arch. Environ. Contam. Toxicol. **30**(3):349-355.

Keywords : biochemical, crude oil, physiology, behavior, mammal, cattle, ingestion, dosed, Otwo, fresh water, biochemistry

[ Effects on cattle receiving single oral doses of varying amounts of Pembina Cardium crude oil; clinical signs, physiology, and biochemistry.]

**Khan, A. A., R. W. Coppock, M. M. Schuler, A. K. Sharma, and L. E. Lillie.** 1989. Induction of

hepatic cytochrome P-450 and xenobiotic metabolizing enzymes in rats gavaged with an Alberta crude oil. J. Toxicol. Environ. Health **28**(3):297-307.

Keywords : rat, crude oil, weight, biochemical, metabolism, mammal, Otwa, Alberta

[ Effects on weight and a variety of biochemical measures of rats receiving oral doses of Alberta crude oil for 4 days.]

**Khan, M. A. Q., S. M. Al-Ghais, and S. Al-Marri.** 1995. Petroleum hydrocarbons in fish from the Arabian Gulf. Arch. Environ. Contam. Toxicol. **29**(4):517-522.

Keywords : petroleum hydrocarbons, Othree, fish, Arabian Gulf, accumulation, elimination, salt water, aromatic hydrocarbons, species, aromatic, hydrocarbons

[ Assessment of the accumulation and elimination of aromatic hydrocarbons by several species of fish from the Arabian Gulf.]

**Khan, R. A.** 1990. Parasitism in marine fish after chronic exposure to petroleum hydrocarbons in the laboratory and to the Exxon Valdez oil spill. Bull. Environ. Contam. Toxicol. **44**(5):759-763.

Keywords : fish, petroleum hydrocarbons, parasite, Exxon Valdez, spill, crude oil, species, Othree, gill, tissue, pathology, salt water, water, Alaska

[ Evaluation of parasitism in marine fish following exposure to crude oil. Two species experimentally exposed to crude oil in water for 12 weeks and one species collected from Prince William Sound, Alaska. Incidence of parasites in gill tissue and pathological evaluation of gills.]

**Khan, R. A.** 1991. Influence of concurrent exposure to crude oil and infection with *Trypanosoma murmanensis* (Protozoa: Mastigophora) on mortality in winter flounder, *Pseudopleuronectes americanus*. Can. J. Zool. **69**(4):876-880.

Keywords : crude oil, juvenile, winter flounder, oiled, sediment, parasite, Hibernia crude oil, survival, blood, organ, Othree, salt water, flounder, fish

[ Effects of concurrent or separate exposure of juvenile and adult winter flounder for 8 weeks to oiled sediment and a protozoan parasite; Hibernia crude oil, survival, blood characteristics, organ indices.]

**Khan, R. A.** 1991. Effect of oil-contaminated sediment on the longhorn sculpin (*Myoxocephalus octodecemspinosus*) following chronic exposure. Bull. Environ. Contam. Toxicol. **47**(1):63-69.

Keywords : sediment, sculpin, crude oil, weight, length, condition, organ, parasite, gill, Hibernia crude oil, Othree, fish

[ Assessment of the effects on longhorn sculpin of exposure to oil-contaminated sediment. Exposed sculpin to sediment contaminated with Hibernia crude oil for 6 mo in the primary experiment and two additional trials of 3-4 mo. At 3 and 6 mo, measured weight, length, condition factor, organ somatic indices, hemoglobin, hematocrit, lymphocytes, melting and freezing point of sera, and parasites on the gill and in the digestive tract.]

**Khan, R. A.** 1998. Influence of petroleum at a refinery terminal on feral winter flounder, *Pleuronectes americanus*. Bull. Environ. Contam. Toxicol. **61**(6):770-777.

Keywords : petroleum, refinery, winter flounder, flounder, Newfoundland, weight, length, liver, spleen, kidney, gill, abundance, parasite, pathology, Othree, salt water, fish

[ Winter flounder were collected near a refinery in Newfoundland and at a reference site. Flounder were compared for differences between sites. Measured weight, length, lesions in liver, spleen, kidney, and gill, and abundance of parasites.]

**Khan, R. A.** 1999. Study of pearl dace (*Margariscus margarita*) inhabiting a stillwater pond contaminated with diesel fuel. Bull. Environ. Contam. Toxicol. **62**(5):638-645.

Keywords : diesel, diesel fuel, Labrador, population, tissue, physiology, monooxygenase, liver, blood, Othree, fresh water, fish

[ Comparison between pearl dace collected from a pond (Goose Bay, Labrador) chronically contaminated with diesel fuel and from a reference pond. Measured population and morphological characteristics, performed histological evaluations of numerous tissues, measured MFO activity of liver tissue, and counted white blood cells.]

**Khan, R. A. and J. W. Kiceniuk.** 1989. Sublethal effects of crude oil on a cold-water marine leech, *Johanssonia arctica*, following chronic exposure. Bull. Environ. Contam. Toxicol. **43**(4):590-596.

Keywords : crude oil, chronic, Hibernia crude oil, food, cod, emergence, survival, leech, reproduction, cocoon, salt water, Ofour, marine invertebrate

[ Assessment of the effects of the water-soluble fractions (WSF) of Hibernia crude oil on a marine leech. Several experiments conducted: (1) leeches exposed to WSF of 50-100 ppb (49-92 da) and uncontaminated food (cod) or exposed to clean water and food previously exposed (for 92 da) to WSF-contaminated water, (2) leeches exposed to WSF of 50 or 150 ppb for 49 da, and (3) leeches removed from 50 ppb WSF after exposure varying from 9 to 67 da. Measured cocoon production, emergence of young, and survival of young.]

**Khan, R. A. and K. Nag.** 1993. Estimation of hemosiderosis in seabirds and fish exposed to petroleum. Bull. Environ. Contam. Toxicol. **50**(1):125-131.

Keywords : fish, liver, crude oil, bird, salt water, Oone, hemosiderosis

[ Assessment of the incidence of hemosiderosis in the livers of seabirds and fish exposed to crude oil.]

**Khan, R. A. and P. Ryan.** 1991. Long term effects of crude oil on common murres (*Uria aalge*) following rehabilitation. Bull. Environ. Contam. Toxicol. **46**(2):216-222.

Keywords : pathology, crude oil, common murre, rehabilitation, bird, cleaning, salt water, Oone

[ Report of pathologic effects in common murres of crude oil exposure after attempted rehabilitation.]

**Khan, S., M. Irfan, and A. D. Rahimtula.** 1987. The hepatotoxic potential of a Prudhoe Bay crude oil: effect on mouse liver weight and composition. Toxicology **46**():95-105.

Keywords : Prudhoe Bay crude oil, crude oil, mouse, liver, weight, toxicity, dosed, physiology, biochemical, mammal, Otwo, Prudhoe Bay, biochemistry

[ Assessment of the liver toxicity of Prudhoe Bay crude oil; laboratory mice dosed with crude oil for 2 days followed by an evaluation of body and liver weight and liver biochemistry.]

**Khan, S., M. Martin, A. D. Rahimtula, and J. F. Payne.** 1987. Effect of a Prudhoe Bay crude oil

on hepatic and placental drug metabolism in rats. *Can. J. Physiol. Pharmacol.* **65**():2400-2408.

Keywords : Prudhoe Bay crude oil, crude oil, metabolism, rat, physiology, liver, mammal, Otwo, Prudhoe Bay

[ Effects on pregnant rats and their fetuses of single and multiple doses of Prudhoe Bay crude oil; measures of hepatic metabolism in adults and fetuses.]

**Khan, S., J. F. Payne, and A. D. Rahimtula.** 1986. Mechanisms of petroleum hydrocarbon toxicity: destruction of liver microsomal and mitochondrial calcium pump activities by a Prudhoe Bay crude oil. *J. Biochem. Toxicol.* **1**(4):31-43.

Keywords : mammal, Otwo, liver, microsome, Prudhoe Bay crude oil, crude oil, rat, calcium, physiology, biochemical, mitochondria, microsomal, uptake, Prudhoe Bay

[ Effects on rat mitochondrial and microsomal calcium uptake of daily doses (2 days) of Prudhoe Bay crude oil.]

**Khan, S., J. F. Payne, and A. D. Rahimtula.** 1986. Mechanisms of petroleum hydrocarbon toxicity: functional changes in rat liver mitochondria after exposure to a Prudhoe Bay crude oil. *Toxicol. Letters* **32**(1-2):141-146.

Keywords : mammal, Otwo, rat, liver, mitochondria, Prudhoe Bay crude oil, crude oil, respiration, physiology, Prudhoe Bay

[ Effects on respiration of rat liver mitochondria after daily doses (2 days) of Prudhoe Bay crude oil.]

**Khan, S., A. M. Rahman, J. F. Payne, and A. D. Rahimtula.** 1986. Mechanisms of petroleum hydrocarbon toxicity: studies on the response of rat liver mitochondria to Prudhoe Bay crude oil and its aliphatic, aromatic and heterocyclic fractions. *Toxicology* **42**():131-142.

Keywords : mammal, Otwo, rat, liver, mitochondria, Prudhoe Bay crude oil, crude oil, aliphatic, aromatic, nonhydrocarbon, Prudhoe Bay

[ Effects on rat liver mitochondrial function of Prudhoe Bay crude oil and its aliphatic, aromatic, and nonhydrocarbon fractions.]

**Kiceniuk, J. W., G. L. Fletcher, and R. Misra.** 1980. Physiological and morphological changes in a cold torpid marine fish upon acute exposure to petroleum. *Bull. Environ. Contam. Toxicol.* **24**():313-319.

Keywords : fish, Venezuelan crude oil, crude oil, weight, organ, blood, biochemistry, Othree, salt water, cunner

[ Effects on a marine fish (cunner) of 2 weeks of exposure to a surface slick of Venezuelan crude oil; body weight, organ weights, blood characteristics, biochemistry.]

**Kiceniuk, J. W., R. A. Khan, M. Dawe, and U. Williams.** 1982. Examination of interaction of Trypanosome infection and crude oil exposure on hematology of the longhorn sculpin (*Myoxocephalus octodecemspinosus*). *Bull. Environ. Contam. Toxicol.* **28**(4):435-438.

Keywords : Venezuelan crude oil, crude oil, weight, organ, biochemistry, blood, pathology, Othree, salt water, parasite, fish, sculpin

[ Assessment of the interaction of protozoan infection and exposure to the water-soluble fraction of

Venezuelan crude oil in the longhorn sculpin; body weight, organ weights, biochemistry, blood characteristics, pathology.]

**Kiceniuk, J. W., W. R. Penrose, and W. R. Squires.** 1978. Oil spill dispersants cause bradycardia in a marine fish. *Marine Pollut. Bull.* **9**(2):42-45.

Keywords : dispersant, fish, heart, ODthree, salt water, heart rate, rate, cunner

[ Effect on heart rate in a marine fish (cunner) of exposure to two chemical oil dispersants.]

**King, K. A. and C. A. Lefever.** 1979. Effects of oil transferred from incubating gulls to their eggs. *Marine Pollut. Bull.* **10**(11):319-321.

Keywords : gull, eggs, fuel oil, embryo, No.2 fuel oil, plumage, salt water, Oone, bird, feathers

[ No. 2 fuel oil applied to breast feathers of incubating laughing gulls; effects on embryos.]

**King, K. A., S. Macko, P. L. Parker, and E. Payne.** 1979. Resuspension of oil: probable cause of brown pelican fatality. *Bull. Environ. Contam. Toxicol.* **23**():800-805.

Keywords : spill, pelican, plumage, salt water, Oone, Texas, endangered species, bird, brown pelican, oiling, residual oil

[ Report of death of an endangered brown pelican due to oiling caused by residual oil from a spill that occurred 6 weeks previously.]

**King, K. A., C. J. Stafford, B. W. Cain, A. J. Mueller, and H. D. Hall.** 1987. Industrial, agricultural, and petroleum contaminants in cormorants wintering near the Houston Ship Channel, Texas, USA. *Colonial Waterbirds* **10**(1):93-99.

Keywords : cormorant, wintering, Texas, carcass, tissue, hydrocarbons, salt water, Oone, bird, petroleum, petroleum hydrocarbons

[ Report of the analysis of cormorant carcass tissue for petroleum hydrocarbons at the beginning and end of the wintering period.]

**Kingston, P. F.** 1992. Impact of offshore oil production installations on the benthos of the North Sea. *ICES J. Mar. Sci.* **49**():45-53.

Keywords : North Sea, review, distance, numbers, benthic, species, diversity, sediment, concentration, petroleum hydrocarbons, salt water, Ofour, marine invertebrate, population, community

[ Overall assessment of the effect of offshore oil installations on benthos of the North Sea. Reviews data from other sources on a variety of measures related to distance from oil platform; number of benthic species, numbers of individuals, diversity, taxa comparisons between sites, sediment hydrocarbon concentrations, and several biological measures related to sediment hydrocarbon concentrations.]

**Kingston, P. F., I. M. T. Dixon, S. Hamilton, and D. C. Moore.** 1995. The impact of the *Braer* oil spill on the macrobenthic infauna of the sediments off the Shetland Islands. *Mar. Pollut. Bull.* **30**(7):445-459.

Keywords : spill, infauna, benthic, sediment, Shetland, species, diversity, community, population, salt water, Ofour, marine invertebrate

[ Assessment of the effects on benthos of the *Braer* oil spill off the Shetland Islands in January 1993. Samples of sediment and benthos were collected from three locations in April and May 1993. Measured sediment characteristics and identified species, then calculated diversity indices and identified species trends.]

**Klein, S. A. and D. Jenkins.** 1983. the toxicity of jet fuels to fish -- II. The toxicity of JP-8 to flagfish (*Jordanella floridae*) and rainbow trout (*Salmo gairdneri*) and golden shiners (*Notemigonus chryssoleucas*). Water Res. **17**(10):1213-1220.

Keywords : toxicity, jet fuel, fish, rainbow trout, growth, development, reproduction, species, fresh water, accumulation, depuration, golden shiner, flagfish, Othree, water, acute

[ Assessment of the effects of the water-soluble fraction of jet fuel (JP-8) on growth, development, and reproduction in three species of fresh water fish; 96 hr acute bioassay, 4 month continuous-flow bioassay, accumulation and depuration also measured.]

**Knap, A. H.** 1987. Effects of chemically dispersed oil on the brain coral, *Diploria strigosa*. Mar. Pollut. Bull. **18**(3):119-122.

Keywords : coral, crude oil, flow-through, Corexit 9527, uptake, depuration, metabolism, photosynthesis, survival, behavior, long-term, growth, Arabian Light crude oil, salt water, Odfour, marine invertebrate

[ Evaluation of the effects of chemically dispersed Arabian Light crude oil on coral in a flow-through experimental system supplemented by a field study. Corals exposed for 6 or 24 hr to either crude oil, crude oil plus Corexit 9527, or crude oil plus BP 1100 WD in the lab. Field exposure employed placing exposure chambers over coral on the sea floor and and injecting dispersed crude oil into the chamber for 6 hr. Measured hydrocarbon uptake and depuration, lipid metabolism and photosynthesis, survival, behavior, and long-term (1 yr) growth after exposure.]

**Knap, A. H., J. E. Solbakken, R. E. Dodge, T. D. Sleeter, S. J. Wyers, and K. H. Palmork.** 1982. Accumulation and elimination of (9-<sup>14</sup>C) phenanthrene in the reef-building coral (*Diploria strigosa*). Bull. Environ. Contam. Toxicol. **28**(3):281-284.

Keywords : accumulation, phenanthrene, coral, uptake, depuration, petroleum, labelled, flow-through, Ofour, salt water, marine invertebrate

[ Evaluation of the uptake and depuration by reef coral of radio-labelled phenanthrene as a surrogate for petroleum. Coral exposed for 24 hr to labelled phenanthrene in a flow-through laboratory system and monitored for 10 da for depuration.]

**Knap, A. H., S. C. Wyers, R. E. Dodge, T. D. Sleeter, H. R. Frith, S. R. Smith, and C. B. Cook.** 1985. The effects of chemically and physically dispersed oil on the brain coral *Diploria strigosa* (Dana) -- a summary review. Anonymous. 1985 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.547-551. American Petroleum Institute. Washington, DC.

Keywords : effects, coral, review, Arabian Light crude oil, crude oil, dispersant, Corexit 9527, flow-through, recovery, survival, behavior, uptake, depuration, photosynthesis, growth, long-term, monitoring, salt water, Odfour, marine invertebrate, spill

[ Summary of 3 yrs of laboratory and field work on the effects on reef coral of Arabian light crude oil



with or without dispersants (Corexit 9527 or BP 1100WD). Exposure of coral for up to 24 hrs in a flow-through laboratory system was followed by recovery periods of up to 20 da. Measured survival, behavior, uptake and depuration of hydrocarbons, photosynthesis, and skeletal growth. In some studies, corals were exposed in the field. Some corals exposed in the laboratory were transferred to field sites for long-term monitoring in excess of 1 yr.]

**Kocan, R. M., M. B. Matta, and S. M. Salazar.** 1996. Toxicity of weathered coal tar for shortnose sturgeon (*Acipenser brevirostrum*) embryos and larvae. Arch. Environ. Contam. Toxicol. **31**(2):161-165.

Keywords : toxicity, weathered, embryo, larvae, sediment, survival, concentration, aromatic hydrocarbons, fish, sturgeon, Othree, coal tar, aromatic, hydrocarbons

[ Assessment of the toxic effects of weathered coal tar deposits in sediments of the Connecticut River on embryos and larvae of shortnose sturgeon; survival, sediment concentrations of aromatic hydrocarbons.]

**Koning, C. W. and S. E. Hrudey.** 1992. Sensory and chemical characterization of fish tainted by exposure to oil sand wastewaters. Water Sci. Technol. **25**(2):27-34.

Keywords : fish, oil sands, waste water, taint, Othree, fresh water, wastewater, Alberta, chemical analysis, bile

[ Evaluation of the potential for fish tainting caused by the extraction wastewaters from the oil sands area of Alberta; four wastewater preparations, chemical analysis of fillet, bile, and treated wastewater.]

**Kornilios, S., P. G. Drakopoulos, and C. Dounas.** 1998. Pelagic tar, dissolved/dispersed petroleum hydrocarbons and plastic distribution in the Cretan Sea, Greece. Mar. Pollut. Bull. **36**(12):989-993.

Keywords : petroleum hydrocarbons, plastic, tar ball, distribution, survey, dissolved, litter, salt water, Oten, miscellaneous

[ Survey of the distribution of dissolved or dispersed petroleum hydrocarbons, floating tar, and plastic litter in the Cretan Sea, Greece. Samples collected from 25 sampling stations in July 1997.]

**Koster, A. S. and J. A. M. Van Den Biggelaar.** 1980. Abnormal development of *Dentalium* due to the Amoco Cadiz oil spill. Mar. Pollut. Bull. **11**():166-169.

Keywords : development, Amoco Cadiz, spill, crude oil, reproduction, female, France, embryo, larvae, bivalve, salt water, Ofour, marine invertebrate

[ Comparison of reproduction of the bivalve, *Dentalium vulgare*, in females collected before the Amoco Cadiz spill with those collected from coastal France after the spill. Measured development of embryos and larvae.]

**Koth, T. and E. Vauk-Hentzelt.** 1988. Influence of plumage and stomach oiling on body and organ growth in young kittiwakes. Marine Pollut. Bull. **19**(2):71-73.

Keywords : plumage, growth, kittiwake, oiled, liver, weight, GI tract, salt water, Oone, pathology, bird, nestling

[ Measurements on dead oiled kittiwake nestlings and fledglings found on Helgoland (German Bight)

revealed effects on liver weight and body weight.]

**Krahn, M. M., D. G. Burrows, G. M. Ylitalo, D. W. Brown, and C. A. Wigren.** 1992. Mass spectrometric analysis for aromatic compounds in bile of fish sampled after the *Exxon Valdez* oil spill. *Environ. Sci. Technol.* **26**():116-126.

Keywords : fish, Exxon Valdez, spill, aromatic hydrocarbons, salmon, pollock, species, Othree, salt water, bile, metabolite, aromatic, hydrocarbons

[ Analysis of pollock and salmon bile for presence of metabolites of aromatic hydrocarbons following the Exxon Valdez spill.]

**Krahn, M. M., L. J. Kittle,Jr., and W. D. MacLeod,Jr.** 1986. Evidence for exposure of fish to oil spilled into the Columbia River. *Marine Environ. Res.* **20**():291-298.

Keywords : fish, sturgeon, spill, metabolite, aromatic hydrocarbons, bile, Othree, fresh water, residual oil, petroleum, aromatic, hydrocarbons

[ Assessment of petroleum exposure of white sturgeon downriver of a spill of heavy residual oil in the Columbia River, WA; measured metabolites of aromatic hydrocarbons in bile.]

**Krahn, M. M., G. M. Ylitalo, J. Buzitis, J. L. Bolton, C. A. Wigren, S.-L. Chan, and U. Varanasi.** 1993. Analyses for petroleum-related contaminants in marine fish and sediments following the Gulf oil spill. *Marine Pollut. Bull.* **27**():285-292.

Keywords : fish, sediment, Gulf oil spill, spill, bile, Arabian Gulf, aromatic hydrocarbons, metabolite, Othree, salt water, aromatic, hydrocarbons, species

[ Analyses of fish bile and sediments from the Arabian Gulf 1 year after the Gulf War (1991) for the presence of aromatic hydrocarbons and their metabolites. Fish species was the sheiry (*Lethrinus kallopterus*).]

**Krause, P. R.** 1995. Spatial and temporal variability in receiving water toxicity near an oil effluent discharge site. *Arch. Environ. Contam. Toxicol.* **29**(4):523-529.

Keywords : waste water, toxicity, effluent, discharges, eggs, sperm, sea urchin, oil field, fertilization, salt water, Ofour, marine invertebrate, California

[ Assessment of the effects on eggs and sperm of the purple sea urchin of a produced- water discharge from onshore oil fields. Eggs and sperm exposed to receiving waters from a sampling transect over a 2-yr period (spatial and temporal aspects), dilutions of the effluent, and a confirmation study performed to confirm that the effluent discharge was the actual cause of the effects observed. Measured fertilization success.]

**Krebs, C. T. and K. A. Burns.** 1977. Long-term effects of an oil spill on population of the salt-marsh crab *Uca pugnax*. *Science* **197**(4302):484-487.

Keywords : long-term, spill, population, salt marsh, crab, fuel oil, No.2 fuel oil, petroleum hydrocarbons, sediment, density, sex, ratio, juvenile, survival, tissue, concentration, behavior, salt water, Ofour, marine invertebrate, effects, petroleum, hydrocarbons, diet

[ Field and laboratory assessment of the effect on salt marsh crabs of the No. 2 fuel oil spill at West Falmouth in 1969. Related petroleum hydrocarbons in sediment to crab density, adult sex ratios,

juvenile settlement, overwinter survival, hydrocarbons in tissue, and burrow construction during the 7-yr period after the spill. Evaluated the effect of fuel oil in the diet on behavior in a laboratory experiment.]

**Kuehn, R. L., K. D. Berlin, W. E. Hawkins, and G. K. Ostrander.** 1995. Relationships among petroleum refining, water and sediment contamination, and fish health. *J. Toxicol. Environ. Health* **46**():101-116.

Keywords : water, sediment, fish, refinery, effluent, species, chemical characteristics, Texas, stream, species diversity, community, pathology, community similarity, Othree, fresh water, diversity  
[ Assessment of the effects of refinery effluents on fish species and chemical characteristics of water and sediment in three Texas streams; species diversity, community similarity, pathology.]

**Kuhnhold, W. W.** 1972. The influence of crude oils on fish fry. Ruivo M (ed.), *Marine Pollution and Sea Life*, pp.315-318. Fishing News (Books) Ltd. London.

Keywords : crude oil, fish, cod, eggs, herring, larvae, survival, behavior, plaice, malformation, Othree, salt water

[ Effects on cod eggs and cod, herring, and plaice larvae of exposure to the water-soluble fractions of three crude oils, a physical dispersion of one crude oil, and a chemical dispersion of one crude oil; survival, malformations, behavior.]

**Kurelec, B., S. Britvic, M. Rijavec, W. E. G. Muller, and R. K. Zahn.** 1977. Benzo(a)pyrene monooxygenase induction in marine fish - molecular response to oil pollution. *Marine Biol.* **44**():211-216.

Keywords : fish, species, spill, diesel fuel, crude oil, biomarker, monooxygenase, salt water, ODthree, dispersant, condition

[ Assessment of the induction of benzo(a)pyrene monooxygenase in two fish species under experimental conditions and at spill sites; diesel fuel, crude oil, biomarker.]

**Lambert, G., D. B. Peakall, B. J. R. Philogene, and F. R. Engelhardt.** 1982. Effect of oil and oil dispersant mixtures on the basal metabolic rate of ducks. *Bull. Environ. Contam. Toxicol.* **29**(5):520-524.

Keywords : dispersant, mallard, crude oil, Corexit 9527, salt water, Prudhoe Bay crude oil, ODone, metabolism, physiology, bird, rate

[ Effect on mallard metabolic rate of exposure to undispersed and dispersed Prudhoe Bay crude oil.]

**Lancaster, J. E., M. G. Pawson, G. D. Pickett, and S. Jennings.** 1998. The impact of the 'Sea Empress' oil spill on seabass recruitment. *Mar. Pollut. Bull.* **36**(9):677-688.

Keywords : spill, England, abundance, age, condition, feeding, growth, fish, salt water, Othree, activity

[ Assessment of the effects of the Sea Empress oil spill on seabass in the Bristol Channel, England. Measured abundance and year class strength of 0-group bass, length-weight, age, condition and feeding activity, date of arrival in nursery areas, and growth.]

**Lange, R.** 1985. A 100 tons experimental oil spill at Halten Bank, off Norway. Anonymous. 1985 Oil

Spill Conference (Prevention, Behavior, Control, Cleanup), pp.503-505. American Petroleum Institute. Washington, DC.

Keywords : spill, Norway, crude oil, experiment, degradation, microbes, nutrients, density, composition, plankton, Ofour, salt water, marine invertebrate

[ Summary description of a large experimental crude oil spill off the coast of Norway in 1982. Movement of spilled oil was tracked for 1 wk. A variety of experiments dealt with microbial degradation of oil, nutrient turnover, and density and species composition of plankton.]

**Larsen, E. M. and S. A. Richardson.** 1990. Some effects of a major oil spill on wintering shorebirds at Grays Harbor, Washington. *Northwestern Naturalist* **71**(1):88-92.

Keywords : spill, wintering, fuel oil, Bunker C, shorebird, salt water, Oone, population, plumage, Washington, bird, oiling

[ Oiling of wintering shorebirds caused by No. 6 fuel oil from the barge Nestucca in Grays Harbor, Washington.]

**Latimer, J. S. and J. G. Quinn.** 1998. Aliphatic petroleum and biogenic hydrocarbons entering Narragansett Bay from tributaries under dry weather conditions. *Estuaries* **21**(1):91-107.

Keywords : petroleum, hydrocarbons, saturated hydrocarbons, gasoline, fuel oil, crankcase oil, unresolved complex mixture, time, fresh water, Oten, miscellaneous

[ Determination of hydrocarbons entering Narragansett Bay from four rivers during dry conditions. Sampled water every 2 wk from Oct. 1, 1990 to Aug. 4, 1991 and analyzed for saturated hydrocarbons. Identified anthropogenic sources as either gasoline, No. 2 fuel oil, No. 6 fuel oil, used crankcase oil, or unresolved complex mixture.]

**Laughlin, R. and O. Linden.** 1983. Oil pollution and Baltic mysids: acute and chronic effects of the water soluble fractions of light fuel oil on the mysid shrimp *Neomysis integer*. *Mar. Ecol. Prog. Ser.* **12**(1):29-41.

Keywords : acute, chronic, fuel oil, No.1 fuel oil, shrimp, experiment, flow-through, temperature, survival, oxygen, ammonium, petroleum hydrocarbons, concentration, salt water, Ofour, marine invertebrate

[ Assessment of the effects of water-soluble fractions of No. 1 fuel oil on mysid shrimp in experiments using flow-through aquaria. Shrimp were kept at four temperatures (6, 10, 15, or 20 C) and subjected to either chronic (2 wk) or acute exposure. Measured survival, oxygen consumption, ammonium excretion, and hydrocarbon concentrations.]

**Laughlin, R. B., Jr. and J. M. Neff.** 1981. Ontogeny of respiratory and growth responses of larval mud crabs *Rhithropanopeus harrisi* exposed to different temperatures, salinities and naphthalene concentrations. *Mar. Ecol. Prog. Ser.* **5**(1):319-332.

Keywords : growth, crab, temperature, salinity, naphthalene, concentration, hatching, respiration, rate, salt water, Ofour, marine invertebrate

[ Larval mud crabs exposed continuously from hatching through the first crab stage to 75, 150, or 300 ppb of naphthalene in water at combinations of three levels of salinity and temperature. Respiration rates determined for 2nd and 4th zoeal, megalops, and first crab stage. An osmotic-shock respiratory

response was assessed in one salinity group. Also weighed crabs in the megalops stage.]

**Laughlin, R. B., Jr, J. Ng, and H. E. Guard.** 1981. Hormesis: a response to low environmental concentrations of petroleum hydrocarbons. *Science* **211**(4483):705-707.

Keywords : concentration, petroleum hydrocarbons, crab, jet fuel, development, survival, rate, weight, growth, hormesis, salt water, Ofour, marine invertebrate

[ Exposed zoeal stage mud crabs to varying concentrations of water-soluble fraction of jet fuel (JP5) for 5 da or the duration of zoeal development (11-14 da). Measured survival, rate of development, and megalop weight. An example of hormetic response to chemical challenge.]

**Laughlin, R. B., Jr., L. G. L. Young, and J. M. Neff.** 1978. A long-term study of the effects of water-soluble fractions of No. 2 fuel oil on the survival, development rate, and growth of the mud crab *Rhithropanopeus harrisii*. *Mar. Biol.* **47**():87-95.

Keywords : long-term, No.2 fuel oil, fuel oil, survival, development, salt water, growth, crab, concentration, hatching, static, Ofour, naphthalene, marine invertebrate, sex

[ Mud crabs exposed to five concentrations of the water-soluble fraction of No. 2 fuel oil for 6 mo after hatching. Employed a static bioassay. Measured concentrations of three naphthalenes in water, development rate, growth, and sex ratio.]

**Law, A. T.** 1995. Toxicity study of the oil dispersant Corexit 9527 on *Macrobrachium rosenbergii* (de Man) egg hatchability by using a flow-through bioassay technique. *Environ. Pollut.* **88**(3):341-343.

Keywords : dispersant, Corexit 9527, eggs, hatchability, flow-through, bioassay, concentration, hatching, Odfour, salt water, marine invertebrate

[ Exposure of a prawn in a flow-through bioassay to five concentrations of Corexit 9527 in water. Eggs were exposed until hatching (about 12 da). Measured hatching rate.]

**Law, R. J., C. A. Kelly, K. L. Graham, R. J. Woodhead, P. E. J. Dyrinda, and E. A. Dyrinda.** 1997. Hydrocarbons and PAH in fish and shellfish from southwest Wales following the *Sea Empress* oil spill in 1966. Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.205-211. American Petroleum Institute. Washington, DC.

Keywords : hydrocarbons, fish, England, spill, concentration, shellfish, crustacean, aromatic hydrocarbons, crude oil, fuel oil, salt water, Othree, marine invertebrate, Wales

[ Measurement of the concentration of PAHs and total hydrocarbons in finfish, shellfish, and crustaceans during the 6 mo following the Sea Empress oil spill near Milford Haven, England, 1996.]

**Lawler, G. C., J. P. Holmes, D. M. Adamkiewicz, M. I. Shields, J. Y. Monnat, and J. L. Laseter.** 1979. Characterization of petroleum hydrocarbons in tissues of birds killed in the *Amoco Cadiz* oil spill. Anonymous. Amoco Cadiz. Fate and Effects of the Oil Spill, pp.573-583. Publie par le Centre National pour L'Exploitation des Oceans. Paris, France.

Keywords : hydrocarbons, tissue, bird, Amoco Cadiz, spill, muscle, liver, saturated, aromatic, salt water, Oone, fate, chemical analysis, petroleum, petroleum hydrocarbons, species

[ Results of the chemical analysis for petroleum hydrocarbons of muscle and liver tissue of several species of seabirds found washed ashore in the area affected by the Amoco Cadiz oil spill.]

**Lawler, G. C., J. P. Holmes, B. J. Fiorito, J. L. Laseter, and R. C. Szaro.** 1979. Quantification of petroleum hydrocarbons in selected tissues of male mallard ducklings chronically exposed to South Louisiana crude oil. Bates CC (ed.), The Proceedings of the Conference of Assessment of Ecological Impacts of Oil Spills, pp.583-612. American Institute of Biological Sciences. Arlington, VA.

Keywords : hydrocarbons, tissue, male, mallard, duckling, South Louisiana crude oil, crude oil, liver, diet, heart, kidney, aromatic, saturated, Oone, spill, bird, chemical analysis, petroleum, petroleum hydrocarbons, Louisiana

[ Results of chemical analysis of heart, liver, and kidney tissue from mallard ducklings for petroleum hydrocarbons. Ducklings fed diets containing varying amounts of South Louisiana crude oil for 8 weeks.]

**Lawler, G. C., W.-A. Loong, and J. L. Laseter.** 1978. Accumulation of aromatic hydrocarbons in tissues of petroleum-exposed mallard ducks (*Anas platyrhynchos*). Environ. Sci. Technol. **12**(1):51-54.

Keywords : aromatic, hydrocarbons, Oone, tissue, mallard, dosed, crude oil, South Louisiana crude oil, bird, chemical analysis, aromatic hydrocarbons, Louisiana

[ Results of chemical analysis for aromatic hydrocarbons in several tissues of mallards dosed with South Louisiana crude oil for 14 days.]

**Lawler, G. C., W.-A. Loong, and J. L. Laseter.** 1978. Accumulation of saturated hydrocarbons in tissues of petroleum-exposed mallard ducks (*Anas platyrhynchos*). Environ. Sci. Technol. **12**(1):47-51.

Keywords : saturated, hydrocarbons, tissue, mallard, dosed, crude oil, South Louisiana crude oil, Oone, bird, chemical analysis, saturated hydrocarbons, duck, Louisiana

[ Results of chemical analysis for saturated hydrocarbons of several tissues from mallard ducks dosed with South Louisiana crude oil for 14 days.]

**Le Dreau, Y., F. Gilbert, P. Doumenq, L. Asia, J. Bertrand, and G. Mille.** 1997. The use of hopanes to track *in situ* variations in petroleum composition in surface sediments. Chemosphere **34**(8):1663-1672.

Keywords : petroleum, composition, sediment, rate, degradation, saturated, isoprenoid, alkane, ratio, Online, technical, hopane, salt water

[ Experimentation to demonstrate the utility of using hopanes to measure the rate of degradation of less stable saturated petroleum compounds. Compared with the frequently-used ratios of *n*-alkanes and isoprenoids. Used marine sediments as a test medium.]

**Le Dreau, Y., F. Jacquot, P. Doumenq, M. Guiliano, J. C. Bertrand, and G. Mille.** 1997.

Hydrocarbon balance of a site which had been highly and chronically contaminated by petroleum wastes of a refinery (from 1956 to 1992). Mar. Pollut. Bull. **34**(6):456-468.

Keywords : petroleum hydrocarbons, refinery, sediment, effluent, aliphatic, aromatic, terpane, sterane,

Oten, salt water, miscellaneous, hydrocarbons

[ Analysis of sediment cores taken at eight stations along intervals from a French refinery toward the open ocean. The refinery ceased discharging effluents 2 yr prior to the sampling. Hydrocarbons analyzed by GC/MS (aliphatic & aromatic profiles, terpanes, steranes).]

**Lee, J. H. and G. Talaska.** 1999. Effects of kerosene cleaning on the formation of DNA adducts in the skin and lung tissues of mice dermally exposed to used gasoline engine oil. *J. Toxicol. Environ. Health A* **56**(7):463-470.

Keywords : kerosene, used motor oil, motor oil, cleaning, skin, tissue, lung, DNA adduct, Otowo, mammal

[ Determination of the effect of dermally-applied used engine oils on DNA adduct formation in laboratory mice. Mice were exposed to used engine oil alone, kerosene alone, used engine oil application followed in 1 hr by a kerosene wash, and used engine oil application followed in 8 hrs by a kerosene wash. Applications were made daily for 5 consecutive days. Measured total DNA adducts in skin and lung after completion of the experiment. Beware of a mislabelled x-axis for Fig. 1.]

**Lee, R. F. and D. S. Page.** 1997. Petroleum hydrocarbons and their effects in subtidal regions after major oil spills. *Mar. Pollut. Bull.* **34**(11):928-940.

Keywords : petroleum hydrocarbons, subtidal, spill, review, concentration, sediment, toxicity, fish, benthic, macrofauna, infauna, salt water, marine invertebrate, Oeigh, general effect, petroleum, hydrocarbons, region

[ Review of published information on the effects of petroleum hydrocarbons on subtidal regions after major oil spills. Discusses hydrocarbon concentrations, sedimentation, sediment toxicity, effects on fish, benthic macrofauna and benthic infauna.]

**Lee, R. F., C. Ryan, and M. L. Neuhauser.** 1976. Fate of petroleum hydrocarbons taken up from food and water by the blue crab *Callinectes sapidus*. *Mar. Biol.* **37**(4):363-370.

Keywords : fate, petroleum hydrocarbons, food, water, blue crab, crab, uptake, aromatic hydrocarbons, paraffin, flow-through, depuration, gill, blood, hepatopancreas, stomach, muscle, gonads, concentration, metabolism, Ofour, salt water, marine invertebrate

[ Measurement of uptake from water and food of radiolabeled paraffinic and aromatic hydrocarbons by immature blue crabs in flow-through aquaria. Crabs exposed for 2 da and then transferred to clean water for measurement of depuration. Uptake from water measured in gill, blood hepatopancreas, stomach, and muscle. Uptake from food measured in stomach, blood, hepatopancreas, gill, muscle, gonad, and excreted material. Measured radiolabeled concentrations, excretion, and metabolism.]

**Lee, W. Y.** 1977. The effects of the water soluble fractions of No. 2 fuel oil on the survival and behaviour of coastal and oceanic zooplankton. *Environ. Pollut.* **12**():279-292.

Keywords : water, No.2 fuel oil, fuel oil, survival, zooplankton, static, bioassay, experiment, time, behavior, Ofour, salt water, marine invertebrate

[ Assessment of the effects of the water-soluble-fraction (WSF) of No. 2 fuel oil on coastal and oceanic zooplankton using static bioassays. The coastal zooplankton experiment used dilutions of 1, 5, 10, 20, and 50% WSF and an exposure time of 48 hr. Survival was checked at hours 1, 3, 6, 10, 16,

24, 36, and 48. The oceanic zooplankton experiment used dilutions of 1, 10, 20, 30, 40, and 50% WSF and an exposure time of 72 hrs. Survival was checked at hours 1, 6, 10, 16, 24, 36, and 72. Measured survival and behavior of zooplankton.]

**Lee, W. Y.** 1978. Chronic sublethal effects of the water soluble fractions of No. 2 fuel oils on the marine isopod, *Sphaeroma quadridentatum*. Mar. Environ. Res. **1**():5-17.

Keywords : chronic, sublethal, fuel oil, No.2 fuel oil, isopod, juvenile, adult, survival, growth, reproduction, Ofour, salt water, marine invertebrate

[ Juvenile marine isopods exposed to the water-soluble-fraction (WSF) of a No. 2 fuel oil (Baytown) for 7 mos. Offspring were kept in clean sea water. Measured survival, growth, and reproduction of adults and survival of offspring. In another experiment, adult isopods were exposed to the WSF of four different fuel oils (Baton Rouge, Baytown, Montana, and New Jersey) for 1 mo. Measured survival and reproduction.]

**Lee, W. Y., A. Morris, and D. Boatwright.** 1980. Mexican oil spill: a toxicity study of oil accommodated in seawater on marine invertebrates. Mar. Pollut. Bull. **11**(8):231-234.

Keywords : spill, toxicity, marine invertebrate, weathered, Ixtoc I crude oil, crude oil, juvenile, community, zooplankton, survival, composition, Ofour, salt water, invertebrate, amphipod

[ Evaluation of the toxicity of weathered Ixtoc I crude oil on marine invertebrates. Exposed juvenile amphipods and a community of natural zooplankton to dilutions (1, 10, 20, 30, 40, and 50%) of water-accommodated, weathered crude oil. Amphipods were exposed for 7 da and the natural zooplankton for 96 hr. Measured survival and chemical composition of the test mixture.]

**Lee, W. Y. and J. A. C. Nicol.** 1978. Individual and combined toxicity of some petroleum aromatics to the marine amphipod *Elasmopus pecteniscrus*. Mar. Biol. **48**():215-222.

Keywords : toxicity, aromatic, amphipod, concentration, adult, static, bioassay, combination, petroleum hydrocarbons, Ofour, salt water, marine invertebrate, No.2 fuel oil, fuel oil

[ Assessment of the toxicity of a range of concentrations of the water-soluble-fraction (WSF) of No. 2 fuel oil and four of its aromatic constituents to an adult marine amphipod. A static bioassay was used to expose amphipods to the WSF for 7 da or to the aromatics for 96 hr. All possible combinations (16) of the four were tested.  $LC_{50s}$  were calculated for all test substances.]

**Lee, W. Y. and J. A. C. Nicol.** 1980. Toxicity of a fuel oil to the eggs of *Parhyale hawaiiensis* and *Amphitoe valida* (amphipoda). Mar. Environ. Res. **3**(4):297-305.

Keywords : toxicity, fuel oil, eggs, No.2 fuel oil, embryo, juvenile, amphipod, static, bioassay, hatching, female, survival, development, Ofour, salt water, marine invertebrate

[ Assessment of the toxicity of the water-soluble-fraction (WSF) of No.2 fuel oil to the developing embryos and juveniles of two species of marine amphipods. Embryos of one species were exposed in static bioassays to 10, 20, 30, or 40% WSF until hatching; juveniles were exposed for a further 7 da. Egg-carrying females of the second species were exposed to 10, 20, or 30% WSF for 5 da. Measured survival and development of embryos.]

**Lee, W. Y., M. F. Welch, and J. A. C. Nicol.** 1977. Survival of two species of amphipods in



aqueous extracts of petroleum oils. Mar. Pollut. Bull. **8**(4):92-94.

Keywords : survival, amphipod, No.2 fuel oil, South Louisiana crude oil, toxicity, fuel oil, crude oil, adult, static, bioassay, concentration, Ofour, salt water, marine invertebrate

[ Assessment of the toxicity of the water-soluble-fraction (WSF) of No. 2 fuel oil and South Louisiana crude oil to adults of two species of marine amphipods. Amphipods were exposed in a static bioassay to WSF concentrations varying from 2 to 50%. One species exposed for 14 da, the other for 30 da. Measured survival three times per wk.]

**Lee, W. Y., K. Winters, and J. A. C. Nicol.** 1978. The biological effects of the water-soluble fractions of a No. 2 fuel oil on the planktonic shrimp, *Lucifer faxoni*. Environ. Pollut. **15**(3):167-183.

Keywords : fuel oil, No.2 fuel oil, shrimp, static, bioassay, weathered, composition, survival, feeding, activity, respiration, Ofour, salt water, marine invertebrate

[ Assessment of the effects of the water-soluble-fractions (WSF) of No. 2 fuel oil on a planktonic shrimp. One experiment used 1, 10, 20, 30, 40, or 50% of fresh WSF in a static bioassay for 14 da. Another experiment used 1, 10, 20, 30, 40, or 50% of weathered (48 hrs) No. 2 fuel oil in a static bioassay for 14 da. Measured composition of the WSF, and survival, feeding rate, activity, and respiration of the shrimp.]

**Lee, Y.-Z., F. A. Leighton, D. B. Peakall, R. J. Norstrom, P. J. O'Brien, J. F. Payne, and A. D. Rahimtula.** 1985. Effects of ingestion of Hibernia and Prudhoe Bay crude oils on hepatic and renal mixed function oxidase in nestling herring gulls (*Larus argentatus*). Environ. Res. **36**(1):248-255.

Keywords : ingestion, crude oil, herring gull, gull, chicks, dosed, metabolism, salt water, Oone, Prudhoe Bay crude oil, Hibernia crude oil, bird, herring, Prudhoe Bay

[ Effects on metabolic responses of herring gull chicks of dosing with Prudhoe Bay and Hibernia crude oils.]

**Lee, Y.-Z., P. J. O'Brien, J. F. Payne, and A. D. Rahimtula.** 1986. Toxicity of petroleum crude oils and their effect on xenobiotic metabolizing enzyme activities in the chicken embryo *in ovo*. Environ. Res. **39**(1):153-163.

Keywords : crude oil, chicken, embryo, metabolism, survival, eggs, egg shell, Prudhoe Bay crude oil, Hibernia crude oil, Oone, bird, Prudhoe Bay, shell

[ Effects on metabolism and survival of chicken embryos as a result of application of Prudhoe Bay and Hibernia crude oils to the egg shell.]

**Lefcort, H., K. A. Hancock, K. M. Maur, and D. C. Rostal.** 1997. The effects of used motor oil, silt, and the water mold *Saprolegnia parasitica* on the growth and survival of mole salamanders (Genus *Ambystoma*). Arch. Environ. Contam. Toxicol. **32**(4):383-388.

Keywords : growth, survival, salamander, motor oil, development, silt, water mold, Othree, amphibian, fresh water, experiment, water

[ Assessment of the effects of used motor oil and silt on the growth and development of larval mole salamanders; four-part experiment, survival, growth, susceptibility of water mold.]

**Leighton, F. A.** 1985. Morphological lesions in red blood cells from herring gulls and Atlantic puffins ingesting Prudhoe Bay crude oil. *Vet. Pathol.* **22**(3):393-402.

Keywords : gull, Prudhoe Bay crude oil, crude oil, herring gull, dosed, bird, puffin, salt water, Oone, red blood cell, anemia, blood, cell, herring, Atlantic

[ Effects on red blood cells of herring gulls and Atlantic puffins of dosing for 4-5 days with Prudhoe Bay crude oil.]

**Leighton, F. A.** 1990. The systemic toxicity of Prudhoe Bay crude and other petroleum oils to CD-1 mice. *Arch. Environ. Contam. Toxicol.* **19**(2):257-262.

Keywords : mammal, Otto, crude oil, Bunker C, fuel oil, mineral oil, blood, liver, Prudhoe Bay crude oil, South Louisiana crude oil, Arabian Light crude oil, physiology, pathology, thymus, spleen, Prudhoe Bay, Louisiana, light

[ Effects on laboratory mice of varying doses of Prudhoe Bay, South Louisiana, and Arabian Light crude oils, Bunker C fuel oil, and mineral oil for 5 days; blood characteristics, liver, spleen, and thymus.]

**Leighton, F. A.** 1991. The toxicity of petroleum oils to birds: an overview. White J, Frink L, Williams TM, and Davis RW (eds.), *The Effects of Oil on Wildlife*, pp.43-57. The Sheridan Press. Hanover, PA.

Keywords : bird, review, toxicity, external, internal, population, physiology, pathology, Oone, petroleum

[ A general review of the literature on toxic effects of petroleum on birds.]

**Leighton, F. A., Y. Z. Lee, A. D. Rahimtula, P. J. O'Brien, and D. B. Peakall.** 1985.

Biochemical and functional disturbances in red blood cells of herring gulls ingesting Prudhoe Bay crude oil. *Toxicol. Appl. Pharmacol.* **81**(1):25-31.

Keywords : biochemical, red blood cell, herring gull, gull, crude oil, Prudhoe Bay crude oil, anemia, salt water, Oone, bird, blood, cell, herring, Prudhoe Bay

[ Effects on red blood cells of herring gulls as a result of dosing with Prudhoe Bay crude oil.]

**Leighton, F. A., D. B. Peakall, and R. G. Butler.** 1983. Heinz-body hemolytic anemia from the ingestion of crude oil: a primary toxic effect in marine birds. *Science* **220**(4599):871-873.

Keywords : anemia, dosed, crude oil, red blood cell, bird, herring gull, gull, salt water, puffin, Oone, herring, Atlantic, Prudhoe Bay

[ Report of hemolytic anemia in young herring gulls and Atlantic puffins dosed with Prudhoe Bay crude oil.]

**Lenihan, H. S., J. S. Oliver, J. M. Oakden, and M. D. Stephenson.** 1990. Intense and localized benthic marine pollution around McMurdo Station, Antarctica. *Mar. Pollut. Bull.* **21**(9):422-430.

Keywords : benthic, sediment, petroleum hydrocarbons, Antarctica, metals, fish, liver, muscle, infauna, Ofour, salt water, marine invertebrate

[ Sampled sediment at various locations around McMurdo Sound, Antarctica and analyzed for total

petroleum hydrocarbons and selected metals. Analyzed metals in fish liver and muscle and in a benthic worm. Sampled and classified the benthic infauna at the same sites where sediments were collected.]

**Leung, T. S. and R. V. Bulkley.** 1979. Effects of petroleum hydrocarbons on length of incubation and hatching success in the Japanese medaka. *Bull. Environ. Contam. Toxicol.* **23**(1/2):236-243.

Keywords : petroleum hydrocarbons, incubation, hatching, experiment, crude oil, eggs, concentration, benzene, toluene, xylene, behavior, Othree, fresh water, fish, water

[ A series of experiments documenting the effects of the water soluble fraction (WSF) of a crude oil from Wyoming on the developing eggs of Japanese Medaka. (1) 8-day-old eggs exposed to four concentrations of WSF for 96 hr, (2) 0 to 9-day-old eggs exposed to one concentration of WSF for 24, 48, or 96 hrs, (3) opercular movements in 8-day-old eggs exposed to one concentration of WSF, (4) opercular movements in 8-day-old eggs exposed to benzene, toluene, or xylene.]

**Levings, S. C. and S. D. Garrity.** 1994. Effects of oil spills on fringing red mangroves (*Rhizophora mangle*): losses of mobile species associated with submerged prop roots. *Bull. Mar. Sci.* **54**(3):782-794.

Keywords : spill, Panama, mangrove, habitat, density, algae, isopod, crude oil, salt water, Ofour, marine invertebrate, marine plant

[ Evaluation of the effects of the 1986 Bahia las Minas oil spill in coastal Panama on fringing red mangrove habitat. Selected 4-5 study sites each in open coastal habitat and sheltered coastal habitat along with controls for each. Measured the density of submerged mangrove prop roots and their use by foliose red algae (yrs 2-5 post-spill) and boring isopods (yrs 3-5 post-spill).]

**Levings, S. C., S. D. Garrity, and K. A. Burns.** 1994. The Galeta oil spill. III. Chronic reoiling, long-term toxicity of hydrocarbon residues and effects on epibiota in the mangrove fringe. *Estuarine Coastal Shelf Sci.* **38**(4):365-395.

Keywords : spill, chronic, long-term, toxicity, mangrove, Panama, stream, concentration, oyster, mussel, condition, transplant, experiment, crude oil, salt water, Ofour, marine invertebrate, marine plant

[ Evaluation of the effects of the Bahia las Minas oil spill on mangroves in coastal Panama during the 5 yrs post-spill. Four to five sites were selected in (1) open sea coastal mangroves, (2) edges of channels and lagoons, and (3) banks of streams or man-made cuts draining interior mangroves or uplands. Measured amount of chronic reoiling from trapped crude oil, concentration of oil in oysters and false mussels, condition of mangrove roots, and percent cover of sessile plants and animals on the roots. Also performed a transplant experiment involving movement of false mussels from unoiled freshwater sites to previously-oiled freshwater sites.]

**Levy, E. M.** 1980. Oil pollution and seabirds: Atlantic Canada 1976-77 and some implications for northern environments. *Marine Pollut. Bull.* **11**(2):51-56.

Keywords : Atlantic, Canada, bird, population, spill, salt water, Oone

[ An assessment of the oil pollution situation in Atlantic Canada and implications for cold environments.]

**Levy, E. M.** 1983. Commentary: what impact will the oil industry have on seabirds in the Canadian Arctic? *Arctic* **36**(1):1-4.

Keywords : population, petroleum development, bird, salt water, Oone, Canada, Arctic, development

[ Assessment of the threat to seabird populations of oil development in the Canadian Arctic.]

**Lewis, S. J. and R. A. Malecki.** 1983. Reproductive success of great black-backed and herring gulls in response to egg oiling. Rosie D and Barnes SN (eds.), *The Effects of Oil on Birds: Physiological Research, Clinical Applications and Rehabilitation*, pp.98-113. Tri-State Bird Rescue and Research, Inc. Wilmington, DE.

Keywords : herring gull, gull, eggs, Kuwait crude oil, crude oil, No.2 fuel oil, plumage, great black-backed gull, salt water, Oone, bird, research, rehabilitation, embryo, herring, Kuwait, fuel oil, oiling

[ Great Black-backed and herring gulls, Kuwait crude oil, and No. 2 fuel oil were used in an assessment of the effects of egg oiling and plumage oiling of incubating adults in a natural setting.]

**Lewis, S. J. and R. A. Malecki.** 1984. Effects of egg oiling on Larid productivity and population dynamics. *The Auk* **101**(5):584-592.

Keywords : eggs, population, No.2 fuel oil, herring gull, gull, great black-backed gull, salt water, Oone, embryo, bird, fuel oil, herring

[ Results of applying No. 2 fuel oil to the eggs of great black-backed and herring gulls in a natural setting.]

**Li, M. and C. Garrett.** 1998. The relationship between oil droplet size and upper ocean turbulence. *Mar. Pollut. Bull.* **36**(12):961-970.

Keywords : petroleum hydrocarbons, emulsion, viscous shear, pressure force, salt water, fresh water, Online, technical

[ An examination of the physical mechanisms that generate oil droplets and determine their size.]

**Lin, Q. and I. A. Mendelssohn.** 1998. The combined effects of phytoremediation and biostimulation in enhancing habitat restoration and oil degradation of petroleum contaminated wetlands. *Ecol. Engineering* **10**(3):263-274.

Keywords : restoration, degradation, petroleum, Louisiana, South Louisiana crude oil, crude oil, Spartina, transplant, species, fertilizer, concentration, soil, biomass, wetland, marine plant, Oten, salt water

[ Louisiana marsh sod treated with 4,8,16, or 24 liters per m<sup>2</sup> of South Louisiana crude oil. Above ground vegetation clipped after 9 mos, allowed to regrow from rhizomes, and clipped again at 15 mos after oil application. At 2 yrs post-application, two spartina species were transplanted to the sod with or without the addition of fertilizer. The transplanted spartina was harvested at 6 mos and 12 mos after transplantation. Petroleum concentration in the soil was determined at 2 yrs and 3 yrs post-application. Measured above ground biomass and stem density.]

**Linden, O.** 1975. Acute effects of oil and oil/dispersant mixture on larvae of Baltic herring. *Ambio*

4(3):130-133.

Keywords : larvae, herring, dispersant, Venezuelan crude oil, crude oil, survival, behavior, malformation, fish, salt water, ODthree

[ Effects on Baltic herring larvae of exposure to physically dispersed and chemically dispersed (two dispersants) Venezuelan crude oil; survival, behavior, malformations.]

**Linden, O.** 1976. The influence of crude oil and mixtures of crude oil/dispersants on the ontogenic development of the Baltic herring, *Clupea harengus membras* L. Ambio 5(3):136-140.

Keywords : crude oil, herring, dispersant, Venezuelan crude oil, eggs, larvae, hatching, malformation, heart, survival, growth, ODthree, fish, salt water, activity, rate

[ Effects of physically dispersed and chemically dispersed (three dispersants) Venezuelan crude oil on eggs and larvae of the Baltic herring; hatching success, malformations, activity, heart beat rate, larval survival, larval malformations, and larval growth.]

**Linden, O.** 1976. Effects of oil on the reproduction of the amphipod *Gammarus oceanicus*. Ambio 5(1):36-37.

Keywords : reproduction, amphipod, Venezuelan crude oil, crude oil, experiment, juvenile, concentration, salt water, Ofour, marine invertebrate, effects, water, weathered

[ Effects of a shaken mixture of Venezuelan crude oil and sea water on reproduction of a marine amphipod. In one experiment, a single level of exposure (1 ppm nominal, 0.3-0.4 ppm actual) was used to determine its effect on production of juveniles. In a second experiment, concentrations of 1, 10, 20, or 40 ppm (weathered for 24 hrs) were used for 192 hrs; measured tendency to move into the precopulatory stage.]

**Linden, O.** 1976. Effects of oil on the amphipod *Gammarus oceanicus*. Environ. Pollut. 10(4):239-250.

Keywords : amphipod, crude oil, Venezuelan crude oil, fuel oil, No.1 fuel oil, No.4 fuel oil, static, experiment, adult, juvenile, long-term, survival, behavior, growth, reproduction, salt water, Ofour, marine invertebrate

[ Evaluation of the effects of Venezuelan crude oil, No. 1 fuel oil, or No. 4 fuel oil on a marine amphipod. An oil and seawater mixture was shaken and allowed to stand for 1 hr before static exposures began. A series of experiments determined 48 hr LC<sub>50</sub> for adults and juveniles, long-term (60 da) effects of low levels of the three oils, long-term (60 da) effects of the water-soluble portion of the crude oil mixture, and the long-term (30da) post-exposure effect of 100 or 300 ppm crude oil and seawater mixture as a single dose for 48 hr. Measured survival, behavior, growth, and reproduction.]

**Linden, O.** 1977. Sublethal effects of oil on mollusc species from the Baltic Sea. Water Air Soil Pollut. 8():305-313.

Keywords : sublethal, Iranian crude oil, crude oil, mussel, intertidal, snail, clam, burrowing, behavior, salt water, Ofour, marine invertebrate

[ Evaluation of the sublethal effects of aged (24 hr) water-soluble-fraction of Iranian crude oil on the blue mussel, an intertidal snail, and the Baltic clam. Measured byssus formation in blue mussels, burrowing behavior in Baltic clams, and crawling behavior in the snail.]

**Linden, O.** 1978. Biological effects of oil on early development of the Baltic herring *Clupea harengus membras*. Marine Biol. **45**():273-283.

Keywords : fish, herring, eggs, larvae, No.1 fuel oil, crude oil, fertilization, malformation, hatching, heart, hatching time, survival, growth, fuel oil, activity, salt water, Othree, rate, time

[ Effects on eggs (three developmental stages) and larvae of the Baltic herring of exposure to the water-soluble fractions of No. 1 fuel oil and two crude oils; fertilization, malformations, hatching success, activity, heart beat rate, hatching time, larval survival, larval malformations, and larval growth.]

**Linden, O., R. Laughlin, Jr., J. R. Sharp, and J. M. Neff.** 1980. The combined effect of salinity, temperature and oil on the growth pattern of embryos of the killifish, *Fundulus heteroclitus* Walbaum. Marine Environ. Res. **3**(2):129-144.

Keywords : temperature, growth, embryo, fuel oil, development, malformation, concentration, combination, No.2 fuel oil, sublethal, salt water, Othree, fish, salinity

[ Sublethal effects on killifish embryos of exposure to varying concentrations of the water-soluble fraction of No. 2 fuel oil under varying temperature and salinity combinations; development and malformations.]

**Linden, O., J. R. Sharp, R. Laughlin, Jr., and J. M. Neff.** 1979. Interactive effects of salinity, temperature and chronic exposure to oil on the survival and developmental rate of embryos of the estuarine killifish *fundulus heteroclitus*. Marine Biol. **51**():101-109.

Keywords : salinity, temperature, chronic, survival, embryo, concentration, fuel oil, development, No.2 fuel oil, salt water, fish, Othree

[ Effects on embryos of the killifish of exposure to varying concentrations of the water-soluble fraction of No. 2 fuel oil, three salinities, and three temperatures; survival and development.]

**Lindstedt-Siva, J., P. H. Albers, K. W. Fucik, and N. G. Maynard.** 1984. Ecological considerations for the use of dispersants in oil spill response, STP 840. Allen TE (ed.), ASTM Standard Technical Publications, pp.363-377. ASTM. Philadelphia, PA.

Keywords : dispersant, spill, habitat, guidelines, coral reef, sea grass, mammal, bird, salt water, rocky shore, ODeight, marine invertebrate, marine plant

[ General discussion of the considerations for use of chemical dispersants in different habitats and on different groups of animals. Covers coral reefs, sea grasses, rocky shores, bird habitats, and marine mammal habitats,]

**Lipcius, R. N., C. A. Coyne, B. A. Fairbanks, D. H. Hammond, P. J. Mohan, D. J. Nixon, J. J. Staskiewicz, and H. Heppner.** 1980. Avoidance response of mallards to colored and black water. J. Wildl. Manage. **44**(2):511-518.

Keywords : avoidance, mallard, bird, oil slick, dye, color, behavior, Oone, water

[ Evaluation of colored dyes as potential deterrents for keeping water birds away from oil slicks; mallards used in an experimental apparatus.]

**Lipscomb, T. P., R. K. Harris, R. B. Moeller, J. M. Pletcher, R. J. Haebler, and B. E. Ballachey.** 1993. Histopathologic lesions in sea otters exposed to crude oil. Vet. Pathol. **30**(1):1-11.

Keywords : sea otter, crude oil, oiled, rehabilitation, Exxon Valdez, spill, Prudhoe Bay crude oil, fur, mammal, salt water, Otter, pathology

[ Pathologic findings for oiled sea otters that died at rehabilitation centers after the Exxon Valdez oil spill.]

**Livingstone, D. R.** 1987. Seasonal responses to diesel oil and subsequent recovery of the cytochrome P-450 monooxygenase system in the common mussel, *Mytilus edulis* L., and the periwinkle, *Littorina littorea* L. Sci. Total Environ. **65**(3):3-20.

Keywords : seasonal, diesel, recovery, monooxygenase, mussel, flow-through, tissue, digestive gland, time, mixed-function oxidase, concentration, salt water, Ofour, marine invertebrate

[ Exposure of the blue mussel (4-8 mo) and a periwinkle (16-24 mo) to 30 ppb or 129 ppb of diesel oil in flow-through outdoor basins and then allowed to depurate for 2-9 mo in clean water. Tissue samples (digestive gland and whole animal) were collected three times per year and analyzed for P450 activity and concentrations of 2-3 ring PAHs.]

**Lizarraga-Partida, M. L., F. B. Izquierdo-Vicuna, and I. Wong-Chang.** 1991. Marine bacteria on the Campeche Bank oil field. Mar. Pollut. Bull. **22**(8):401-405.

Keywords : bacteria, oil field, water, sediment, Gulf of Mexico, Mexico, crude oil, salt water, Ofour, marine invertebrate

[ Bimonthly sampling of water and sediment (for 14 mos) from beneath the production platforms of the Campeche Bank oil field, four nearby areas, and from a separate cruise in the southern Gulf of Mexico. Measured heterotrophic bacteria and oil-degrading bacteria.]

**Llorente, G. A., A. Farran, X. Ruiz, and J. Albaiges.** 1987. Accumulation and distribution of hydrocarbons, polychlorobiphenyls, and DDT in tissues of three species of Anatidae from the Ebro Delta (Spain). Arch. Environ. Contam. Toxicol. **16**(5):563-572.

Keywords : hydrocarbons, tissue, duck, alkane, bird, PCB, DDT, algae, freshwater plant, salt water, Oone, Spain, species

[ Assessment of hydrocarbons, PCBs, and DDT in five tissues of three duck species from the Ebro Delta of Spain.]

**Lockhart, W. L., R. Wagemann, J. W. Clayton, B. Graham, and D. Murray.** 1975. Chronic toxicity of a synthetic tri-aryl phosphate oil to fish. Environ. Physiol. Biochem. **5**(6):361-369.

Keywords : chronic, toxicity, fish, rainbow trout, lubricating oil, cholinesterase, blood, physiology, necropsy, synthetic oil, Othree, fresh water, activity

[ Effects on rainbow trout of exposure to a synthetic lubricating oil (IMOL S-140) for 4 months: cholinesterase activity, blood chemistry, physiology, necropsy.]

**Lomholt, J. P.** 1976. The development of the oxygen permeability of the avian egg shell and its membranes during incubation. J. Experimental Zool. **198**(2):177-184.

Keywords : development, eggs, egg shell, incubation, oxygen, bird, permeability, Oone, shell

[ Assessment of the oxygen permeability of avian egg shells during incubation.]

**Longwell, A. C.** 1977. A genetic look at fish eggs and oil. *Oceanus* **20**(4):46-58.

Keywords : fish, eggs, fuel oil, Argo Merchant, spill, development, cell, embryo, malformation, cell division, salt water, Othree, No.2 fuel oil, Bunker C

[ Effects of No. 6 and No. 2 fuel oils from the Argo Merchant oil spill (1976) on fish egg development; cell division, embryo malformations.]

**Lonning, S. and B. E. Hagstrom.** 1976. Deleterious effects of Corexit 9527 on fertilization and development. *Marine Pollut. Bull.* **7**(7):124-126.

Keywords : Corexit 9527, fertilization, development, crude oil, eggs, species, fish, sea urchin, marine invertebrate, dispersant, salt water, ODthree

[ Effects of Corexit 9527 alone or in combination with crude oil on the fertilization and development of eggs of four species of sea urchin and three species of fish.]

**Lopes, C. F., J. C. C. Milanelli, V. A. Prosperi, E. Zanardi, and A. C. Truzzi.** 1997. Coastal monitoring program of Sao Sebastiao Channel: assessing the effects of 'Tebar V' oil spill on rocky shore populations. *Mar. Pollut. Bull.* **34**(11):923-927.

Keywords : monitoring, spill, rocky shore, population, toxicity, beach, mussel, barnacle, salt water, Ofour, marine invertebrate, pipeline, density

[ Assessment of the effects of a coastal pipeline rupture north of Sao Paulo, Brazil. Laboratory toxicity tests and beach assessments of mussel and barnacle density used to measure effect.]

**Lord, D. A., I. H. Kerley, R. M. Randall, J. S. V. Reddering, E. H. Schumann, W. E.**

**Bricknell, S. Rowe, and R. P. Mason.** 1987. The *Kapodistrias* grounding and oil spill Cape Recife, South Africa. Anonymous. 1987 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.33-38. American Petroleum Institute. Washington, DC.

Keywords : spill, South Africa, Africa, fuel oil, bird, shellfish, dispersant, salt water, ODone, behavior, coast

[ Report of the consequences of the grounding of the MV *Kapodistrias* off the coast of South Africa. Small amounts of fuel oil escaped. Description of the spill response and the effects on birds and shellfish.]

**Lorensten, S.-H. and T. Anker-Nilssen.** 1993. Behavior and oil vulnerability of fulmars *Fulmarus glacialis* during an oil spill experiment in the Norwegian Sea. *Marine Pollut. Bull.* **26**(3):144-146.

Keywords : behavior, bird, spill, crude oil, fulmar, vulnerability, Norway, salt water, Oone, experiment

[ Results of an experimental spill of crude oil designed to determine the behavioral response of fulmars to surface oil.]

**Loya, Y. and B. Rinkevich.** 1979. Abortion effect in corals induced by oil pollution. *Mar. Ecol. Prog. Ser.* **1**():77-80.

Keywords : coral, Iranian crude oil, crude oil, concentration, static, bioassay, larvae, reproduction, salt water, Ofour, marine invertebrate



[ Exposure of five colonies of a coral species to the water-soluble-fraction (WSF) of Iranian crude oil. Five concentrations of the WSF were used in static bioassays. Measured the extrusion of planulae larvae by the coral after 1 hr and 6 hrs of exposure.]

**Lusimbo, W. S. and F. A. Leighton.** 1996. Effects of Prudhoe Bay crude oil on hatching success and associated changes in pipping muscles in embryos of domestic chickens (*Gallus gallus*). *J. Wildl. Dis.* **32**(2):209-215.

Keywords : Prudhoe Bay crude oil, crude oil, hatching, muscle, embryo, chicken, pipping, Oone, physiology, pathology, bird, condition, eggshell, oiling, Prudhoe Bay

[ Assessment of the condition of pipping muscles in chicken embryos exposed to oil by eggshell oiling with Prudhoe Bay crude oil.]

**Lutcavage, M. E., P. L. Lutz, G. D. Bossart, and D. M. Hudson.** 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. *Arch. Environ. Contam. Toxicol.* **28**(4):417-422.

Keywords : crude oil, turtle, juvenile, oil slick, weathered, South Louisiana crude oil, behavior, blood, biochemistry, pathology, physiology, Othree, salt water, reptile, Louisiana, condition

[ Effects on juvenile loggerhead sea turtles of exposure (96 hr) to an oil slick of weathered (48 hr) South Louisiana crude oil under experimental conditions; behavior, blood characteristics, biochemistry, pathology, physiology.]

**Maccarone, A. D. and J. N. Brzorad.** 1995. Effects of an oil spill on the prey populations and foraging behavior of breeding wading birds. *Wetlands* **15**(4):397-407.

Keywords : spill, population, behavior, bird, fuel oil, foraging, No.2 fuel oil, Bunker C, New York, New Jersey, fish, marine invertebrate, shrimp, salt water, Oone

[ Report of the effects on foraging by wading birds of several spills of No. 2 and No. 6 fuel oils into the Arthur Kill and Kill Van Kull between NY and NJ in 1990.]

**MacDonald, B. A. and M. L. H. Thomas.** 1982. Growth reduction in the soft-shell clam *Mya arenaria* from a heavily oiled lagoon in Chedabucto Bay, Nova Scotia. *Mar. Environ. Res.* **6**(2):145-156.

Keywords : growth, clam, oiled, shell, spill, Bunker C, tissue, weight, length, age, salt water, Ofour, marine invertebrate

[ Soft shell clams were collected from Chedabucto Bay, Nova Scotia (*Arrow* spill of 1970) after the Bunker C spill and 9 yrs later at the same site and at an unoiled site. Measured tissue weights, shell weight, shell length, clam age, and external morphology of the shell.]

**MacDonald, I. R.** 1998. Oil spills. *Sci. Am. Nov.*( ):57-61.

Keywords : oil seep, Gulf of Mexico, petroleum hydrocarbons, crude oil, salt water, Oeight, general effect

[ A general description of natural oil seeps in the Gulf of Mexico. Author uses historical records, modern assessments of floating oil, and naturalist observations on the adaptation of living organisms to the presence of naturally occurring petroleum.]

**Mackey, A. P. and M. Hodgkinson.** 1996. Assessment of the impact of naphthalene contamination on mangrove fauna using behavioral bioassays. *Bull. Environ. Contam. Toxicol.* **56**(2):279-286.

Keywords : naphthalene, mangrove, bioassay, concentration, gastropod, Australia, sediment, short-term, long-term, snail, time, rate, crawling, salt water, Ofour, marine invertebrate

[ Assessment of the effect of various concentrations of naphthalene on a species of gastropod found in the coastal mangroves of Australia. Collected sediments from two sites in the Brisbane River to determine actual concentrations. Performed short-term (a few min) and long-term (60 min) laboratory exposures of snails. Short-term exposures were conducted at various times during the day. Measured crawling rate of snails as they left contaminated water.]

**Mackie, P. R., R. Hardy, E. I. Butler, P. M. Holligan, and M. F. Spooner.** 1978. Early samples of oil in water and some analyses of zooplankton. *Mar. Pollut. Bull.* **9**(11):296-297.

Keywords : water, zooplankton, Amoco Cadiz, petroleum hydrocarbons, English Channel, Ofour, salt water, marine invertebrate, concentration

[ Water and zooplankton samples were collected shortly after the wreck of the Amoco Cadiz in 1978. Water samples were collected beneath the slick and outside the slick. Zooplankton were collected at three locations in the English Channel. Both water and zooplankton were analyzed for petroleum hydrocarbons.]

**Macko, S. A. and S. M. King.** 1980. Weathered oil: effect on hatchability of heron and gull eggs. *Bull. Environ. Contam. Toxicol.* **25**(2):316-320.

Keywords : weathered, hatchability, gull, eggs, crude oil, Texas, bird, Libyan crude oil, heron, spill, salt water, Oone, Louisiana

[ Effects of weathered and fresh Libyan crude oil on hatchability of eggs of Louisiana herons and laughing gulls in coastal Texas.]

**MacLennan, A. S.** 1986. Oil pollution in the Cromarty Firth and inshore Moray Firth. *Proc. Royal Soc. Edinburgh* **91B**():275-282.

Keywords : review, spill, England, bird, marine invertebrate, population, salt water, Oone, history

[ Review of oil spill incidents in Moray Firth (1975-84) and Cromarty Firth (1970-84) in England with special attention to sea birds.]

**Mageau, C., F. R. Engelhardt, E. S. Gilfillan, and P. D. Boehm.** 1987. Effects of short-term exposure to dispersed oil in Arctic invertebrates. *Arctic* **40**(Suppl. 1):162-171.

Keywords : Arctic, invertebrate, spill, flow-through, sea urchin, bivalve, crude oil, Corexit 9527, concentration, clearance, behavior, tissue, enzyme, hydrocarbons, metabolism, ODfour, marine invertebrate, salt water

[ Follow-up experiments to the 1981 Baffin Island Oil Spill field experiment. An experimental flow-through system constructed near the site of the original oil spill. Three species tested; two bivalves and a sea urchin. Test animals exposed to a chemically-dispersed mixture of Lagomedio crude oil and Corexit 9527 for 18 hrs. The exposure time was partitioned into 3 6-hr periods with different

concentrations per period. Two sequences were used; 0.5, 5.0, 0.2 ppm or 10, 100, 5 ppm followed by clearance periods of either 7 or 21 da. Measured several types of behavior in each species, several measures of metabolic function and tissue enzymes, and hydrocarbon concentrations in water and tissue.]

**Mahaney, P. A.** 1994. Effects of freshwater petroleum contamination on amphibian hatching and metamorphosis. *Environ. Toxicol. Chem.* **13**(2):259-265.

Keywords : amphibian, hatching, concentration, crankcase oil, eggs, growth, tadpole, metamorphosis, Othree, fresh water, algae, treefrog

[ Effects of experimental exposure to three concentrations of used crankcase oil on hatching success of green treefrog eggs, tadpole growth, metamorphosis, and algal growth.]

**Mahoney, B. M. S. and G. S. Noyes.** 1982. Effects of petroleum on feeding and mortality of the American oyster. *Arch. Environ. Contam. Toxicol.* **11**(5):527-531.

Keywords : feeding, oyster, concentration, No.2 fuel oil, fuel oil, Nigerian crude oil, crude oil, sediment, depuration, weight, shell, condition, index, Ofour, salt water, marine invertebrate, adult

[ Assessment of the effects on adult American oysters of exposure to water concentrations of No. 2 fuel oil (0.05, 0.50 ppm), Nigerian crude oil (0.15, 0.50 ppm), and clay sediment (0.50 ppm).

Exposure times were either 7 wks followed by 7 wks of depuration or 11 wks followed by 8 wks of depuration. Measured death, body weight, shell weight, condition index, and feeding (filtering) rate.]

**Maki, A. W. and W. E. Bishop.** 1979. Acute toxicity studies of surfactants to *Daphnia magna* and *Daphnia pulex*. *Arch. Environ. Contam. Toxicol.* **8**(5):599-612.

Keywords : toxicity, surfactant, daphnia, static, bioassay, anionic, nonionic, adult, structure, ODfour, salt water, marine invertebrate, interactions

[ Conducted a series of static bioassays of the effects of anionic and nonionic surfactants on adults of two *Daphnia* species. Duration of exposure was 48 hr. Determined the influence of surfactant chemical structure, suspended solids, water hardness, and previous surfactant exposures on acute toxicity.]

**Malallah, G., M. Afzal, G. Murin, A. Murin, and D. Abraham.** 1997. Genotoxicity of oil pollution on some species of Kuwait flora. *Biologia Bratislava* **52**(1):61-70.

Keywords : species, growth, genotoxic, germination, freshwater plant, Oseven, Kuwait crude oil, crude oil, salt water, plant, Kuwait

[ Assessment of the effects on terrestrial plants in Kuwait of oil contamination following the Gulf War. Fifteen plants chosen as bioindicators and subjected to pollen abortion analysis, meiotic analysis, and mitotic analysis; also seed germination and the effects of an oil-water extract on root growth.]

**Malins, D. C. and H. O. Hodgins.** 1981. Petroleum and marine fishes: a review of uptake, disposition, and effects. *Environ. Sci. Technol.* **15**(11):1272-1280.

Keywords : review, uptake, fish, chronic, metabolism, behavior, pathology, concentration, Othree, salt water, acute, petroleum

[ Review of petroleum uptake, disposition, and effects in marine fish; acute, chronic, metabolism,

behavior, pathology.]

**Mankki, J. and J. Vauras.** 1974. Littoral fish populations after an oil tanker disaster in the Finnish SW archipelago. *Ann. Zool. Fennici* **11**(2):120-126.

Keywords : fish, population, crude oil, spill, dispersant, age, growth, weight, condition, length, ODthree, salt water, water

[ Assessment of the effects on fish populations of a crude oil spill that occurred two years previous in an area of the Baltic Sea; chemical dispersants were used on the spilled oil. Fish were caught in nearshore waters and characterized by age, growth, condition, and regression of log length on log weight.]

**Mansuy, L., R. P. Philp, and J. Allen.** 1997. Source identification of oil spills based on the isotopic composition of individual components in weathered oil samples. *Environ. Sci. Technol.* **31**(12):3417-3425.

Keywords : spill, composition, weathered, methods, petroleum, isotope, chromatography, Online, technical, experiment, ratio

[ Isotopic analysis of individual compounds in weathered oil samples. Results of experiments with gas chromatography/isotope ratio mass spectrometry (GS/IRMS) as a supplemental method to standard GC/MS or GC procedures for comparing spilled petroleum with presumed source petroleum. Method is promoted for situations involving extensively weathered petroleum.]

**Martin, L. K., Jr. and M. C. Black.** 1996. Biomarker assessment of the effects of petroleum refinery contamination on channel catfish. *Ecotoxicol. Environ. Safety* **33**(1):81-87.

Keywords : biomarker, refinery, metabolism, blood, metals, water, sediment, osmoregulation, genotoxic, fish, catfish, fresh water, Othree, stress, concentration

[ Assessment of the effects of an abandoned oil refinery on caged channel catfish using a suite of indicators; metabolism, blood, osmoregulation, genetic. Emphasis was on the metals in water and sediment at the contaminated site.]

**Marty, D., A. Bianchi, and C. Gatellier.** 1979. Effects of three oil spill dispersants on marine bacterial populations. I. Preliminary study. Quantitative evolution of aerobes. *Mar. Pollut. Bull.* **10**(10):285-287.

Keywords : dispersant, population, fuel oil, concentration, numbers, bacteria, microbes, ODfour, salt water, marine invertebrate

[ Evaluation of the effect on marine bacterial populations of additions of three chemical oil dispersants with or without fuel oil. Several concentrations of the dispersants without fuel oil were monitored for 5 da. Fuel oil with or without several concentrations of dispersants were monitored for 83 da. Measured number of bacteria per unit volume of water.]

**Marty, G. D., J. E. Hose, M. D. McGurk, E. D. Brown, and D. E. Hinton.** 1997. Histopathology and cytogenetic evaluation of Pacific herring larvae exposed to petroleum hydrocarbons in the laboratory or in Prince William Sound, Alaska, after the *Exxon Valdez* oil spill. *Can. J. Fish. Aquat. Sci.* **54**(8):1846-1857.

Keywords : Pacific herring, larvae, Prince William Sound, Alaska, Exxon Valdez, spill, eggs,

concentration, Prudhoe Bay crude oil, crude oil, hatching, pathology, salt water, Othree, fish, Pacific, herring, oiled, Prudhoe Bay

[ Pacific herring larvae were collected from oiled and reference sites in Prince William Sound shortly after the 1989 Exxon Valdez spill and subjected to histopathological examination. Herring eggs were exposed to varying concentrations of Prudhoe Bay crude oil in laboratory exposure studies and subjected to histopathological examination within 24 hr of hatching. Lesions from the two studies were compared.]

**Marty, G. D., J. W. Short, D. M. Dambach, N. H. Willits, R. A. Heintz, S. D. Rice, J. J.**

**Stegeman, and D. E. Hinton.** 1997. Ascites, premature emergence, increased gonadal cell apoptoxis, and cytochrome P4501A induction in pink salmon larvae continuously exposed to oil-contaminated gravel during development. *Can. J. Zool.* **75**(6):989-1007.

Keywords : pink salmon, larvae, development, concentration, weathered, Prudhoe Bay crude oil, crude oil, sediment, eggs, survival, growth, aromatic, alkane, air, pathology, monooxygenase, metabolism, fish, Othree, salt water, salmon, Prudhoe Bay, emergence

[ Exposure of pink salmon larvae to four concentrations of weathered Prudhoe Bay crude oil in sediment; fertilized eggs placed on sediment, larvae retained until 13 da post-emergence. Sampled at 4 wk before emergence, at emergence, and 13 da post-emergence; survival, growth, thorough macro- and micropathology assessment, P4501A (CYP1A) induction by immunohistochemistry, and aromatic and alkane analysis of gravel, incubator air, and larvae.]

**Massoud, M. S., F. Al-Abdali, and A. N. Al-Ghadban.** 1998. The status of oil pollution in the Arabian Gulf by the end of 1993. *Environ. Internat.* **24**(1/2):11-22.

Keywords : Arabian Gulf, organic carbon, petroleum hydrocarbons, hydrocarbons, metals, sediment, crude oil, spill, Oten, miscellaneous, salt water, organic, carbon, petroleum

[ Collected core samples from bottom of Arabian Gulf in 1993 and compared findings with results of core samples collected in 1992. Measured total organic carbon, total petroleum hydrocarbons, and trace metals.]

**Massoud, M. S., F. Al-Abdali, A. N. Al-Ghadban, and M. Al-Sarawi.** 1996. Bottom sediments of the Arabian Gulf -- II. TPH and TOC contents as indicators of oil pollution and implications for the effect and fate of the Kuwait oil slick. *Environ. Pollut* **93**(3):271-284.

Keywords : sediment, Arabian Gulf, Gulf oil spill, crude oil, TPH, TOC, Oten, miscellaneous

[ TPH and TOC in sediments of the Arabian Gulf.]

**Mathers, E. M., D. F. Houlihan, and M. J. Cunningham.** 1992. Estimation of saithe *Pollachius virens* growth rates around the Beryl oil platforms in the North Sea: a comparison of methods. *Marine Ecol. Prog. Ser.* **86**():31-40.

Keywords : growth, North Sea, metabolism, fish, organ, crude oil, biochemistry, saithe, Othree, salt water, rate, time

[ Growth and metabolic rates of a fish (saithe) around oil platforms in the North Sea are compared to the same rates in open ocean saithe; platform fish sampled four times in a 1-year period.]

**Mathews, C. P., S. Kedid, N. I. Fita, A. Al-Yahya, and K. Al-rasheed.** 1993. Preliminary assessment of the effects of the 1991 Gulf War on Saudi Arabian prawn stocks. *Mar. Pollut. Bull.* **27**():251-271.

Keywords : decline, fishery, prawn, plankton, survey, spill, population, Gulf oil spill, Ofour, marine invertebrate, salt water

[ An evaluation of the decline of the Saudi Arabian prawn fishery in the Persian Gulf after the Gulf War. Analyzes the fishery before and after the war with catch data and plankton surveys. Discussion of the possible effects of the Gulf War oil spill and oil well fires on prawn populations.]

**Mattie, D. R., G. B. Marit, C. D. Flemming, and J. R. Cooper.** 1995. The effects of JP-8 jet fuel on male Sprague-Dawley rats after a 90-day exposure by oral gavage. *Toxicol. Industrial Health* **11**(4):423-435.

Keywords : jet fuel, male, rat, dosed, blood, urine, metabolite, weight, organ, tissue, biochemistry, pathology, Otwo, mammal, rate, numbers

[ Male laboratory rates dosed daily for 90 da with 750, 1500, or 3000 mg/kg of JP-8 jet fuel. Measured blood and urine chemistry, JP-8 and metabolites in blood and urine, body weight, organ weights, and performed pathological examination of a large number of tissues.]

**Maynard, D. J. and D. D. Weber.** 1981. Avoidance reactions of juvenile coho salmon (*Oncorhynchus kisutch*) to monocyclic aromatics. *Can. J. Fish. Aquat. Sci.* **38**(3):772-778.

Keywords : avoidance, juvenile, salmon, aromatic, concentration, benzene, toluene, xylene, fish, Othree, fresh water

[ Avoidance response of juvenile coho salmon exposed to varying concentrations of benzene, toluene, *o*-xylene or a mixture of all three.]

**Mazet, J. A. K., I. A. Gardner, D. A. Jessup, and J. H. Rittenburg.** 1997. Field assay for the detection of petroleum products on wildlife. *Bull. Environ. Contam. Toxicol.* **59**(4):513-519.

Keywords : detection, fur, feathers, assay, Online, bird, mammal, technical, soil

[ Description of a portable workstation for detection of PAH in soil that was modified to serve as an inexpensive field detection device for PAHs on feathers or fur.]

**McCormick-Ray, M. G.** 1987. Hemocytes of *Mytilus edulis* affected by Prudhoe Bay crude oil emulsion. *Mar. Pollut. Bull.* **22**():107-122.

Keywords : Prudhoe Bay crude oil, crude oil, emulsion, flow-through, adult, mussel, tissue, storage, follicle, spawning, bivalve, Ofour, salt water, marine invertebrate, effects, Prudhoe Bay, water

[ A flow-through laboratory system was used to determine the effects on adult *Mytilus edulis* mussels of exposure to Prudhoe Bay crude oil. Mussels were exposed to 390 or 740 ppb of crude oil in water emulsion for 9 wks and examined after 4-5 wks and 8-9 wks. Counted several hemocytes in hemolymph and estimated spawning stage by quantifying percentage of mantle tissue used for follicles or storage.]

**McDonald, S. J., M. C. Kennicutt II, H. Liu, and S. H. Safe.** 1995. Assessing aromatic hydrocarbon exposure in Antarctic fish captured near Palmer and McMurdo Stations, Antarctica.

Arch. Environ. Contam. Toxicol. **29**(2):232-240.

Keywords : aromatic, aromatic hydrocarbons, Antarctic, fish, experiment, rat, cell, activity, concentration, bile, tissue, sediment, metabolism, metabolite, Othree, salt water, diesel fuel, petroleum, petroleum hydrocarbons, hydrocarbons

[ Assessment of the effects on Antarctic fish near Palmer Station of exposure to petroleum hydrocarbons in the ocean, in laboratory experiments with baP and diesel fuel, and with rat hepatoma cells; metabolic activity and concentrations of PAH in bile, tissues, and sediment.]

**McEwan, E. H.** 1978. The effect of crude oils on salt gland sodium secretion of orally imposed salt loads in glaucous-winged gulls, *Larus glaucescens*. Can. J. Zool. **56**(5):1212-1213.

Keywords : gull, Bunker C, diesel fuel, salt gland, physiology, salt water, Oone, bird, juvenile, glaucous-winged gull

[ Effects on salt gland sodium secretion of juvenile glaucous-winged gulls of oral doses of Bunker C or diesel fuel.]

**McEwan, E. H. and A. F. C. Koelink.** 1973. The heat production of oiled mallards and scaup. Can. J. Zool. **51**(1):27-31.

Keywords : oiled, mallard, experiment, plumage, rehabilitation, bird, scaup, fresh water, Oone, metabolism, physiology, crude oil, oiling

[ Experiment on the thermal consequences of plumage oiling of mallards and scaup. Also, comments on the lack of success of rehabilitation of the oiled birds.]

**McEwan, E. H. and P. M. Whitehead.** 1978. Influence of weathered crude oil on liver enzyme metabolism of testosterone in gulls. Can. J. Zool. **56**(9):1922-1924.

Keywords : weathered, crude oil, liver, metabolism, gull, dosed, physiology, salt water, Oone, bird, enzyme, juvenile, glaucous-winged gull

[ Effects on liver enzyme metabolism of testosterone in juvenile glaucous-winged gulls caused by dosing with weathered crude oil.]

**McEwan, E. H. and P. M. Whitehead.** 1980. Uptake and clearance of petroleum hydrocarbons by the glaucous-winged gull (*Larus glaucescens*) and the mallard duck (*Anas platyrhynchos*). Can. J. Zool. **58**(5):723-726.

Keywords : uptake, hydrocarbons, gull, mallard, duck, crude oil, Bunker C, diesel fuel, elimination, labelled, Oone, bird, glaucous-winged gull

[ Tritiated crude oil, Bunker C, and diesel fuel were fed to glaucous-winged gulls and mallards. Uptake and elimination was measured.]

**McGill, P. A. and M. E. Richmond.** 1979. Hatching success of great black-backed gull eggs treated with oil. Bird-Banding **50**(2):108-113.

Keywords : hatchability, great black-backed gull, gull, eggs, embryo, Maine, No.2 fuel oil, salt water, Oone, bird, eggshell, oiling, fuel oil

[ Effects on embryos of great black-backed gulls of eggshell oiling with No. 2 fuel oil; Appledore Island, Maine.]

**McGrath, E. A. and M. M. Alexander.** 1979. Observations on the exposure of larval bullfrogs to fuel oil. Anonymous. Transactions of the Northeast Section of The Wildlife Society, pp.45-51.  
Keywords : fuel oil, development, concentration, Bunker C, ingestion, behavior, pathology, amphibian, Othree, bullfrog, aromatic hydrocarbons, fresh water  
[ Effects on larval bullfrogs, at several stages of development, of exposure to several concentrations of No. 6 fuel oil (Bunker C); ingestion, behavior, pathology.]

**McGuinness, K. A.** 1990. Effects of oil spills on macro-invertebrates of saltmarshes and mangrove forests in Botany Bay, New South Wales, Australia. J. Exp. Mar. Biol. Ecol. **142**():121-135.  
Keywords : spill, macroinvertebrate, mangrove, salt marsh, Australia, crude oil, oiling, short-term, treatment, weathered, density, snail, crab, seedling, root, Ofour, salt water, marine invertebrate  
[ Evaluation of the effects of spilled crude oil on macroinvertebrates of saltmarsh and mangrove habitat in Botany Bay, Australia. Five sites (three with a history of oiling, two with no such history) were selected for evaluation of effects of previous oiling incidents. One previously unoiled site was used for experimental oiling to determine short-term effects. The experimental treatments were control, once oiled, and twice oiled (6 mos between oiling). Experimental oil was artificially weathered Dubai Light Crude oil. Measured densities of three species of snails, crab holes, mangrove roots, and mangrove seedlings.]

**McKelvey, R. W., I. Robertson, and P. E. Whitehead.** 1980. Effect of non-petroleum oil spills on wintering birds near Vancouver. Marine Pollut. Bull. **11**(6):169-171.  
Keywords : spill, wintering, bird, vegetable oil, Canada, petroleum oil, plumage, salt water, Oone, petroleum  
[ Effect on birds of spills of vegetable oil compared to petroleum oil in Vancouver (Canada) harbor.]

**McKeown, B. A.** 1981. Long-term sublethal and short-term high dose effects of physically and chemically dispersed oil on accumulation and clearance from various tissues of juvenile coho salmon, *Oncorhynchus kisutch*. Marine Environ. Res. **5**(4):295-300.  
Keywords : long-term, sublethal, accumulation, clearance, tissue, juvenile, salmon, labelled, crude oil, dispersant, gill, kidney, liver, muscle, ODthree, fish, hydrocarbons, fresh water, salt water, short-term, Alaska, uptake  
[ Long- (64 da) and short-term (24 da) exposure of juvenile coho salmon to labelled Alaska crude oil and BP1100X chemical dispersant; uptake and clearance, gill, kidney, liver, muscle.]

**McKeown, B. A. and G. L. March.** 1978. The acute effect of Bunker C oil and an oil dispersant on: 1 serum glucose, serum sodium and gill morphology in both freshwater and seawater acclimated rainbow trout (*Salmo gairdneri*). Water Res. **12**():157-163.  
Keywords : acute, Bunker C, dispersant, gill, fresh water, fuel oil, combination, biochemistry, pathology, fish, salt water, ODthree, detergent  
[ Freshwater and seawater acclimated rainbow trout were exposed for 96 hr to Bunker C fuel oil, Oilperse 43 detergent, or a combination; biochemistry, gill pathology.]

**McKeown, B. A. and G. L. March.** 1978. The effects of Bunker C oil and an oil dispersant: part 2



-- effects on the accumulation of chlorine-labelled Bunker C oil in various fish tissues. *Marine Environ. Res.* **1**(2):119-123.

Keywords : Bunker C, dispersant, accumulation, fish, tissue, fuel oil, gill, liver, kidney, muscle, rainbow trout, labelled, fresh water, ODthree

[ Accumulation of Bunker C fuel oil in gill, liver, kidney, and muscle of rainbow trout exposed to labelled fuel oil, either undispersed or chemically dispersed with Oilsperse 43.]

**McLachlan, A. and B. Harty.** 1982. Effects of crude oil on the supralittoral meiofauna of a sandy beach. *Mar. Environ. Res.* **7**(1):71-79.

Keywords : crude oil, sandy beach, beach, Arabian Light crude oil, weathered, dispersant, sand, concentration, nematode, oligochaete, harpacticoid, oxygen, depth, ODfour, salt water, marine invertebrate

[ Assessment of the effects on meiofauna of a South African sandy beach of exposure to Arabian light crude oil. Experimental plots treated with fresh crude oil, crude oil weathered for 1.5 mos, fresh crude oil mixed with a chemical dispersant, and weathered crude oil placed at the water table (20 cm below the sand surface). Plots sampled after 1 and 5 mos. Measured concentrations of nematodes, oligochaetes, and harpacticoids, oxygen concentration at 15-20 cm depth, and petroleum concentrations at depth.]

**McLusky, D. S.** 1982. The impact of petrochemical effluent on the fauna of an intertidal estuarine mudflat. *Estuarine Coastal Shelf Sci.* **14**(5):489-499.

Keywords : effluent, intertidal, estuary, England, discharges, density, biomass, petroleum waste, Ofour, salt water, marine invertebrate

[ Evaluation of the Kinneil intertidal area of the Forth estuary in England. Multiple sources of effluent discharge from petrochemical plants, sewage plants, and a power plant. Intertidal fauna were sampled twice annually from 1975 to 1980 along parallel transects extending away from the sources of effluent. Measured faunal density, biomass, and redox potential.]

**McLusky, D. S. and T. Martins.** 1998. Long-term study of an estuarine mudflat subjected to petro-chemical discharges. *Mar. Pollut. Bull.* **36**(10):791-798.

Keywords : long-term, discharges, infauna, intertidal, estuary, Scotland, abundance, species diversity, ammonium, refinery, toxicity, effluent, salt water, Ofour, marine invertebrate

[ Infauna of the Kinneil intertidal area within the Forth estuary of Scotland were studied from 1976 to 1997 at 90 fixed locations. Measured abundance of each species, diversity indices, BOD, suspended solids, ammonia, and refinery discharges. Also compared toxicity of refinery effluent in 1986 and 1995. Compared trend in pollution reduction with measured biological responses.]

**McMurry, S. T., R. L. Lochmiller, K. McBee, and C. W. Qualls, Jr.** 1999. Indicators of immunotoxicity in populations of cotton rats (*Signodon hispidus*) inhabiting an abandoned oil refinery. *Ecotoxicol. Environ. Safety* **42**(3):223-235.

Keywords : population, cotton rat, rat, refinery, soil, time, condition, organ, weight, blood, immune response, physiology, Otwo, mammal

[ Assessment of the effects of soil contaminants at an abandoned oil refinery on the immune function of

wild cotton rats. Sampled cotton rats at three refinery and three reference sites at four times between January 1991 and September 1992. Measured general immunological and condition indicators, organ weights, blood and immune organ characteristics, and several indicators of immune function.]

**McNab, W. M., Jr.** 1999. Comparisons of geochemical signatures of biotransformation of fuel hydrocarbons in groundwater. *Environ. Monitor. Assess.* **59**(3):257-274.

Keywords : petroleum hydrocarbons, spill, diesel, diesel fuel, gasoline, monitoring, ground water, plume, Onine, fresh water, technical

[ Six subsurface spills of aviation fuel, diesel fuel, or gasoline at military bases were used to determine the best geochemical measures to use as indirect measures of hydrocarbon biotransformation. Nine indicators of (1) the local redox environment and (2) measures involving mass balance determinations were evaluated. Results useful for the collection and interpretation of groundwater monitoring data.]

**McOrist, S. and C. Lenghaus.** 1992. Mortalities of little penguins (*Eudyptula minor*) following exposure to crude oil. *The Veterinary Record* **130**( ):161-162.

Keywords : penguin, crude oil, spill, pathology, physiology, rehabilitation, Australia, bird, salt water, Oone

[ First known report of the effects of a crude oil spill on little penguins; Australia.]

**Melancon, M. J., Jr. and J. J. Lech.** 1978. Distribution and elimination of naphthalene and 2-methylnaphthalene in rainbow trout during short- and long-term exposures. *Arch. Environm. Contam. Toxicol.* **7**(7):207-230.

Keywords : distribution, elimination, rainbow trout, long-term, accumulation, labelled, naphthalene, metabolite, bile, muscle, liver, gill, blood, fish, whole body, Othree, short-term, hydrocarbons

[ Accumulation and elimination by rainbow trout of labelled naphthalene and 2-methylnaphthalene and its metabolites in fat, bile, muscle, liver, gill, blood, and whole fish. Short-term exposure for 8 hrs and longer-term for 4 wks.]

**Meyerhoff, R. D.** 1975. Acute toxicity of benzene, a component of crude oil, to juvenile striped bass (*Morone saxatilis*). *J. Fish. Res. Board Can.* **32**(10):1864-1866.

Keywords : acute, toxicity, benzene, crude oil, juvenile, striped bass, fish, salt water, Othree, aromatic, mammal

[ Determination of the 96 hr LC50 for benzene using juvenile striped bass; discussion of the toxic action of benzene in mammals and fish.]

**Middaugh, D. P., M. E. Shelton, McKenney, Jr., G. Cherr, P. J. Chapman, and L. A.**

**Courtney.** 1998. Preliminary observations on responses of embryonic and larval Pacific herring, *Clupea pallasii*, to neutral fraction biodegradation products of weathered Alaska North Slope oil. *Arch. Environ. Contam. Toxicol.* **34**(2):188-196.

Keywords : herring, biodegradation, weathered, North Slope crude oil, crude oil, embryo, larvae, Pacific herring, degradation, concentration, hatching, growth, survival, malformation, behavior, Othree, salt water, fish, North Slope, Pacific, water, experiment

[ Effects of water-soluble fraction of weathered Alaskan North Slope crude oil on embryos and larvae

of Pacific herring. Crude oil weathered in water for 2-3 da and by microbial degradation for 14 more da. Embryos at 4, 48, or 96 hr postfertilization were exposed to concentrations of 1, 10, or 100% of the WSF and monitored until hatching (performed twice). A second experiment followed growth of selected test groups for 10 da posthatching. Measured survival, malformations, and behavior.]

**Middaugh, D. P. and D. D. Whiting.** 1995. Responses of embryonic and larval inland silversides, *Menidia beryllina*, to No. 2 fuel oil and oil dispersants in seawater. Arch. Environ. Contam. Toxicol. **29**(4):535-539.

Keywords : fuel oil, dispersant, eggs, concentration, combination, survival, development, physiology, malformation, No.2 fuel oil, salt water, ODthree, fish

[ Effects on eggs of inland silversides of exposure to varying concentrations of the water-soluble concentrations of No. 2 fuel oil and Corexit 7664 and 9527, singly and in combination; survival, development, physiology, malformation.]

**Middleditch, B. S., B. Basile, and E. S. Chang.** 1982. Alkanes in shrimp from the Buccaneer oil field. Bull. Environ. Contam. Toxicol. **29**(1):18-23.

Keywords : alkane, shrimp, oil field, Gulf of Mexico, concentration, crude oil, Ofour, salt water, marine invertebrate

[ An evaluation of the alkane content of five species of shrimp collected around two production platforms in the Buccaneer oil field of the Gulf of Mexico. Measured alkane concentration and compared GC patterns.]

**Middleditch, B. S., E. S. Chang, and B. Basile.** 1979. Alkanes in barnacles (*Balanus tintinnabulum*) from the Buccaneer oilfield. Bull. Environ. Contam. Toxicol. **23**(1/2):6-12.

Keywords : alkane, barnacle, oilfield, crude oil, concentration, Gulf of Mexico, tissue, shell, salt water, Ofour, marine invertebrate

[ Assessment of alkane concentrations in barnacles collected from the production platforms and well jackets of the Buccaneer oilfield in the Gulf of Mexico. Barnacle samples were divided into surface and subsurface samples. Measured alkane concentrations of tissue and shell.]

**Middleditch, B. S., E. S. Chang, B. Basile, and S. R. Missler.** 1979. Alkanes in fish from the Buccaneer oilfield. Bull. Environ. Cont. Toxicol. **22**(1-2):249-257.

Keywords : alkane, fish, oilfield, liver, Texas, species, muscle, Othree, petroleum, coast

[ Presence of natural and petroleum alkanes in the muscle and liver of a variety of marine fish caught from the vicinity of the Buccaneer oilfield off the coast of Texas.]

**Mignucci-Giannoni, A. A.** 1999. Assessment and rehabilitation of wildlife affected by an oil spill in Puerto Rico. Environ. Pollut. **104**(2):323-333.

Keywords : rehabilitation, Bunker C, No.6 fuel oil, fuel oil, spill, oiled, species, turtle, bird, fish, marine invertebrate, Oeight, salt water, general effect

[ Report of the biological effects of the grounding of the barge *Morris J. Berman* off the north coast of Puerto Rico in 1994. A list of 5687 individual oiled organisms comprising 152 species is presented, along with results of the attempted rehabilitation of sea turtles and birds.]

**Miller, D. S., R. G. Butler, W. Trivelpiece, S. Janes-Butler, S. Green, B. Peakall, G. Lambert, and D. B. Peakall.** 1980. Crude oil ingestion by seabirds: possible metabolic and reproductive effects. *Bull. Mt. Desert Is. Banding Lab.* **20**():137-138.

Keywords : crude oil, ingestion, herring gull, gull, Prudhoe Bay crude oil, dosed, salt water, ODone, physiology, behavior, dispersant, bird, nestling, herring, Prudhoe Bay  
[ Effects on nestling herring gulls and breeding adult Leach's petrels of dosing with Prudhoe Bay crude oil and chemical dispersant plus crude oil (gulls only).]

**Miller, D. S., D. J. Hallett, and D. B. Peakall.** 1982. Which components of crude oil are toxic to young seabirds? *Environ. Toxicol. Chem.* **1**():39-44.

Keywords : crude oil, South Louisiana crude oil, weight, herring gull, gull, aliphatic, aromatic, salt water, Oone, bird, Louisiana, herring, chicks  
[ Determination of the portions of South Louisiana crude oil responsible for weight loss in herring gull chicks.]

**Miller, D. S., D. B. Peakall, and W. B. Kinter.** 1978. Ingestion of crude oil: sublethal effects in herring gull chicks. *Science* **199**(4326):315-317.

Keywords : ingestion, crude oil, herring gull, gull, Kuwait crude oil, South Louisiana crude oil, physiology, pathology, salt water, Oone, bird, herring, chicks, Kuwait, Louisiana  
[ Effects on herring gull chicks of ingestion of doses of Kuwait or South Louisiana crude oils.]

**Miller, G. J. and D. W. Connell.** 1980. Occurrence of petroleum hydrocarbons in some Australian seabirds. *Aust. Wildl. Res.* **7**():281-293.

Keywords : hydrocarbons, alkane, salt water, Australia, uptake, accumulation, Oone, bird, petroleum, petroleum hydrocarbons, biogenic, origin, species  
[ Report of the presence of petroleum hydrocarbons and hydrocarbons of biogenic origin in several species of seabirds from coastal Australia. Also, discussion of petroleum uptake and accumulation.]

**Minchew, C. D. and J. D. Yarbrough.** 1977. The occurrence of fin rot in mullet (*Mugil cephalus*) associated with crude oil contamination of an estuarine pond-ecosystem. *J. Fish Biol.* **10**():319-323.

Keywords : Empire Mix crude oil, crude oil, fish, mullet, fin rot, salt water, estuarine, Othree, bacteria, stress, fin  
[ Description of fin rot in mullet exposed to Empire Mix crude oil spilled on outdoor ponds; study lasted 56 da following the introduction of oil.]

**Mironov, O. G. and T. L. Shchekaturina.** 1979. Oil change in excretory products of mussels (*Mytilus galloprovincialis*). *Mar. Pollut. Bull.* **10**(8):232-234.

Keywords : mussel, composition, crude oil, petroleum hydrocarbons, alkane, aromatic, concentration, faeces, salt water, Ofour, marine invertebrate  
[ Experiment with mussels in aquaria conducted to determine change in petroleum composition between crude oil in the water and petroleum hydrocarbons in faeces. Mussels acclimated for 2-3 da, exposed to emulsified oil for 10 da, and transferred to clean water for 10 da. Measured alkane and aromatic

concentrations in faeces.]

**Moldan, A. and A. Westphal.** 1994. SANCCOB: the South African National Foundation for the Conservation of Coastal Birds. *Penguin Conserv.* **7**(2):13-16.

Keywords : conservation, bird, history, penguin, salt water, rehabilitation, South Africa, population, Oone, humans

[ Description of the organization SANCCOB, its history, and some history of African penguins and their encounters with humans.]

**Moles, A.** 1980. Sensitivity of parasitized coho salmon fry to crude oil, toluene, and naphthalene. *Anonymous. Transactions of the American Fisheries Society*, pp.293-297. American Fisheries Soc.

Keywords : salmon, fry, crude oil, toluene, naphthalene, fresh water, mussel, larvae, Prudhoe Bay crude oil, Othree, fish, parasite, society, Prudhoe Bay

[ Effect of parasitism by freshwater mussel larvae on the sensitivity of coho salmon fry to the water-soluble fraction of Prudhoe Bay crude oil, toluene, or naphthalene; use of 96 hr LC50 test.]

**Moles, A.** 1998. Sensitivity of ten aquatic species to long-term crude oil exposure. *Bull. Environ. Contam. Toxicol.* **61**(1):102-107.

Keywords : long-term, crude oil, Cook Inlet crude oil, fish, crustacean, echinoderm, static, flow-through, Ofour, marine invertebrate, salt water, species

[ Exposure of two fish, four crustacean, one echinoderm, and three mollusk species to a 4-da and a 28-da flow-through bioassay using the WSF of Cook Inlet crude oil. Compared LC50 results to published data on the LC50s of 4-da static and 4-da flow-through bioassays.]

**Moles, A.** 1999. Parasitism, feeding rate, and hydrocarbon uptake of pink shrimp *Pandalus borealis* fed a crude oil contaminated diet. *Bull. Environ. Contam. Toxicol.* **62**(3):259-265.

Keywords : feeding, aromatic hydrocarbons, uptake, shrimp, Cook Inlet crude oil, crude oil, diet, male, mussel, parasite, concentration, muscle, hepatopancreas, Ofour, salt water, marine invertebrate

[ Male pink shrimp fed mussels previously exposed to the water soluble fraction (WSF) of Cook Inlet crude oil. Used three stocks of oil-exposed mussels. Shrimp fed mussels for 77 da. Experiment conducted in laboratory tanks. Measured death, prevalence of a parasite, feeding rate, and aromatic hydrocarbon concentrations in shrimp muscle and hepatopancreas.]

**Moles, A., M. M. Babcock, and S. D. Rice.** 1987. Effects of oil exposure on pink salmon, *Oncorhynchus gorbuscha*, alevins in a simulated intertidal environment. *Marine Environ. Res.* **21**(1):49-58.

Keywords : salmon, intertidal, concentration, Cook Inlet crude oil, crude oil, growth, development, hatching, fresh water, salt water, Othree, survival, fish, pink salmon, alevin, water

[ Effects of varying concentrations of the water-soluble fraction of Cook Inlet crude oil on growth and development of pink salmon alevins 5 or 60 da after hatching. Used fresh water or a simulated freshwater to saltwater tidal cycle for a 30 da exposure period.]

**Moles, A., S. Bates, S. D. Rice, and S. Korn.** 1981. Reduced growth of coho salmon fry exposed to two petroleum components, toluene and naphthalene, in fresh water. Anonymous. Transactions of the American Fisheries Society, pp.430-436. American Fisheries Soc.

Keywords : growth, salmon, fry, toluene, naphthalene, fresh water, concentration, weight, length, Othree, fish

[ Effects on the growth of coho salmon fry of exposure to varying concentrations of toluene or naphthalene; exposed for 40 days, growth measured as dry weight, wet weight, and length.]

**Moles, A. and B. L. Norcross.** 1998. Effects of oil-laden sediments on growth and health of juvenile flatfishes. Can. J. Fish. Aquat. Sci. **55**(3):605-610.

Keywords : sediment, growth, juvenile, sole, North Slope crude oil, crude oil, fin rot, GI tract, parasite, pathology, gill, liver, tissue, Othree, salt water, fish, oiled, species, Pacific, North Slope, fin

[ Assessment of the effects of oiled sediment on the growth of three species of juvenile flatfish (yellowfin sole, rock sole, Pacific halibut). Flatfish were exposed for 90 da to either mud or sand sediment containing either 1% or 2% North Slope crude oil. Measured growth, caudal fin erosion, GI tract parasites, and pathology of gill and liver tissue.]

**Moles, A. and S. D. Rice.** 1983. Effects of crude oil and naphthalene on growth, caloric content, and fat content of pink salmon juveniles in seawater. Anonymous. Transactions of the American Fisheries Society, pp.205-211. American Fisheries Soc.

Keywords : crude oil, naphthalene, growth, salmon, juvenile, concentration, Cook Inlet crude oil, fat content, caloric content, fish, Othree, salt water, pink salmon

[ Effects on growth, caloric content, and fat content of juvenile pink salmon exposed to varying concentrations of naphthalene or the water-soluble fraction of Cook Inlet crude oil; exposed for 40 da in saltwater.]

**Moles, A., S. D. Rice, and S. Korn.** 1979. Sensitivity of Alaskan freshwater and anadromous fishes to Prudhoe Bay crude oil and benzene. Anonymous. Transactions of the American Fisheries Society, pp.408-414. American Fisheries Soc.

Keywords : fresh water, Prudhoe Bay crude oil, crude oil, benzene, species, fish, concentration, juvenile, eggs, fry, smolt, alevin, Othree, survival, society, Prudhoe Bay

[ Sensitivity of nine species of Alaskan freshwater and anadromous fish to varying concentrations of the water-soluble concentrations of benzene or Prudhoe Bay crude oil. Juveniles or adults of most species were tested; eggs, alevins, fry, or smolts of four salmonids were also tested.]

**Moore, J., F. Bunker, S. Evans, D. Rostron, B. Bullimore, A. Little, J. Hodges, Y.**

**Chamberlain, R. Crump, P. Dyrinda, J. Cremona, and A. Worley.** 1997. *Sea Empress* spill: impacts on marine and coastal habitats. Anonymous. 1977 International Oil Spill Conference.

Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.213-216. Edition API #4651. American Petroleum Institute. Washington, DC.

Keywords : spill, marine plant, invertebrate, community, coast, Wales, salt marsh, intertidal, eelgrass, bivalve, snail, algae, Ofour, marine invertebrate, lichen, general effect, plant

[ A report of the general effects of the Sea Empress oil spill on marine plant and invertebrate

communities of the southwest coast of Wales. Plants included salt marsh vegetation, dune grasses, intertidal macroalgae, eelgrass, and lichens. Invertebrates included bivalves, snails, and crustaceans.]

**Moore, M. N., R. K. Pipe, and S. V. Farrar.** 1982. Lysosomal and microsomal responses to environmental factors in *Littorina littorea* from Sullom Voe. Mar. Pollut. Bull. **13**(10):340-345.

Keywords : microsomal, oil terminal, Scotland, biochemical, gastropod, cell, mussel, tissue, salt water, Ofour, marine invertebrate

[ Evaluation of the effect of proximity to the Sullom Voe Oil Terminal on biochemical characteristics of a marine gastropod. Samples collected from four exposed sites and a control. Measured several biochemical indicators of function in the digestive cells of mussel tissue.]

**Moraitou-Apostolopoulou, M., G. Verriopoulos, and I. Karakassis.** 1986. Effects of pre-exposure on the tolerance of *Artemia salina* to oil and oil dispersant. Mar. Pollut. Bull. **17**(2):72-76.

Keywords : tolerance, dispersant, copepod, crude oil, respiration, pre-exposure, Odfour, salt water, marine invertebrate

[ Assessment of the influence of pre-exposure on the tolerance of a marine copepod to petroleum and dispersant exposure. Exposed copepods to crude oil (dispersions), finasol OSR 2, crude oil and Finasol OSR 2, or Finasol OSR 5 for periods of 2 to 5 da; some exposures were followed by equivalent periods in clean water. Pre-exposed copepods were then tested with 48 hr LC<sub>50</sub> tests or measurement of respiration.

[Presentation of methods and results is confusing; editors and reviewers failed on this one].]

**Morris, R. J., M. E. Dawson, and A. P. M. Lockwood.** 1982. The identification of some lipophilic contaminants in the gill neutral lipids of *Gammarus duebeni*. Mar. Pollut. Bull. **13**(1):13-18.

Keywords : gill, tissue, amphipod, salinity, aromatic hydrocarbons, hydrocarbons, lipids, Ofour, salt water, marine invertebrate

[ A comparison of the contaminants in gill versus body tissue of a marine amphipod. Two groups of amphipods were kept in either 2 ppt (parts per thousand) or 36 ppt salinity for 2 mos. Gills were removed and analyzed for lipids, aromatic hydrocarbons, and other contaminants.]

**Morton, B. and R. S. S. Wu.** 1977. The toxic effects of hydrocarbons upon the naupliar and adult stages of *Balanus* (Crustacea: Cirripedia). Mar. Pollut. Bull. **8**(10):232-236.

Keywords : hydrocarbons, adult, kerosene, dispersant, barnacle, activity, survival, motility, nauplii, salt water, Odfour, marine invertebrate

[ Evaluated the effects of kerosene and the chemical dispersants BP 1002, Bukomkleen, and Chemkleen on two species of barnacle. Nauplii exposed to 2.5, 5, 10, or 25 ppm BP 1002 or 10, 25, 50, or 100 ppm kerosene for 1 hr. Adults exposed to 10, 50, 100, or 500 ppm BP 1002 for 24 or 48 hrs. A 16-hr comparative assessment was made by exposing adult barnacles to 50 ppm of BP 1002, kerosene, Chemkleen, or Bukomkleen. Measured motility and death for nauplii and either cirral activity or death for adults.]

**Mudge, S.** 1997. Can vegetable oils outlast mineral oils in the marine environment? Marine Pollut. Bull.

**34(3):213**

Keywords : sunflower oil, intertidal, degradation, spill, vegetable oil, Oten, miscellaneous  
[ Retention of spilled sunflower oil in the intertidal zone.]

**Mueller, A. J. and C. H. Mendoza.** 1983. The Port Bolivar, Texas oil spill -- a case history of oiled bird survival. Anonymous. 1983 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.521-523. American Petroleum Institute. Washington, DC.

Keywords : Texas, spill, salt water, oiled, bird, survival, rehabilitation, Oone, origin, waterfowl, cleaning

[ Account of an oil spill of unknown origin near Port Bolivar, Texas and its effect on local waterfowl. Also, a description of the cleaning of oiled birds.]

**Multiple.** 1993. Numerous abstracts of reports from the Exxon Valdez oil spill. Pacific Seabird Group Bull. **20(1):**44-47.

Keywords : spill, Exxon Valdez, bird, population, rehabilitation, restoration, Prudhoe Bay crude oil, salt water, Oone, Alaska, species

[ Numerous abstracts of reports of the effects of the Exxon Valdez oil spill on bird populations, individual species, rehabilitation, and restoration.]

**Munoz, D., M. Guiliano, P. Doumenq, F. Jacquot, P. Scherrer, and G. Mille.** 1997. Long term evolution of petroleum biomarkers in mangrove soil (Guadeloupe). Mar. Pollut. Bull. **34(11):**868-874.

Keywords : long-term, biomarker, mangrove, soil, petroleum hydrocarbons, spill, Arabian Light crude oil, crude oil, fingerprinting, salt water, Onine, degradation, technical, petroleum, hydrocarbons, light, origin

[ Report of the degradation of petroleum hydrocarbons in mangrove soil during an 8-year period following a spill of Arabian Light crude oil. Analyses performed at 1, 4, and 8-years post-spill. Emphasis was on identifying compounds that would be good indicators of progressive degradation and that would be sufficiently resistant to be useful as 'identifiers' of the origin of the oil.]

**Murray, A. P., B. J. Richardson, and C. F. Gibbs.** 1991. Bioconcentration factors for petroleum hydrocarbons, PAHs, LABs and biogenic hydrocarbons in the blue mussel. Mar. Pollut. Bull. **22(12):**595-603.

Keywords : petroleum hydrocarbons, biogenic, mussel, water, urban, refinery, Australia, particulate, dissolved, aromatic hydrocarbons, benzene, tissue, Ofour, salt water, marine invertebrate

[ Determination of bioconcentration factors for hydrocarbons in the blue mussel. Water and mussel (cultured, placed on site for 3 mos) samples were collected from a site subject to urban drainage, near an oil refinery, and from two reference sites in coastal Australia. Water was analyzed for particulate and dissolved total hydrocarbons, aromatics, biogenic hydrocarbons, total linear alkyl benzenes, and three specific aromatics. Mussels were analyzed for the same set of analytes in tissue. Bioconcentration factors were calculated.]

**Murray, M.** 1987. Oil spill rehabilitation: results & recommendations for the future. Wildl. J.



10(3):17-20.

Keywords : spill, rehabilitation, oiled, bird, physiology, salt water, Oone

[ Critical assessment of oiled bird rehabilitation procedures after the *Apex Houston* spill.]

**Myers, A. A., T. Southgate, and T. F. Cross.** 1980. Distinguishing the effects of oil pollution from natural cyclical phenomena on the biota of Bantry Bay, Ireland. *Mar. Pollut. Bull.* **11**(7):204-207.

Keywords : Ireland, species, barnacle, mussel, gastropod, numbers, cover, petroleum hydrocarbons, Ofour, salt water, marine invertebrate

[ An attempt to separate the influence of spilled 'oil' from a tanker from the influence of natural phenomena. One species of barnacle, two species of mussel, and one species of gastropod were monitored with sampling transects from July 1978 through July 1979 at three sites in Bantry Bay, Ireland. Numbers of organisms or percent cover (mussels) were measured.]

**Nagelkerken, I. A. and A. O. Debrot.** 1995. Mollusc communities of tropical rubble shores of Curacao: long-term (7+ years) impacts of oil pollution. *Mar. Pollut. Bull.* **30**(9):592-598.

Keywords : community, mollusc, long-term, crude oil, refined oil, tar cover, spill, beach, density, species, structure, salt water, Ofour, marine invertebrate

[ Comparison of the long-term impact of crude and refined oil spills on the mollusc communities of Curacao. Selected four polluted (subjected to many spills  $\geq 7$  yrs previously) and four similar, but unpolluted, sites. Used transects to measure beach zone width, percent tar cover, mollusc density, and mollusc species density, and compared mollusc community structure.]

**Nakatani, R. E. and A. E. Nevissi.** 1991. Effect of Prudhoe Bay crude oil on the homing of coho salmon in marine waters. *North Am. J. Fish. Mgmt.* **11**():160-166.

Keywords : Prudhoe Bay crude oil, crude oil, salmon, dispersant, homing, ODthree, fish, salt water, Prudhoe Bay

[ Effect on homing of 2-3 year-old coho salmon exposed for 1 hr to Prudhoe Bay crude oil, chemically dispersed crude oil, or dispersant alone.]

**Nance, J. M.** 1991. Effects of oil/gas field produced water on the macrobenthic community in a small gradient estuary. *Hydrobiologia* **220**():189-204.

Keywords : water, community, estuary, estuarine, stream, discharges, salinity, sediment, hydrocarbons, oil field, concentration, species, abundance, index, diversity, salt water, Ofour, marine invertebrate

[ An evaluation of the effects of produced water from coastal oil wells on macrobenthos of an estuarine stream. Seventeen sampling stations were located from the stream mouth to 7,700 m upstream and sampled monthly for 1 yr. Sampling stations were located above and below a major produced-water discharge site. Measured salinity, sediment hydrocarbon concentration, species abundance, and calculated index of diversity.]

**Nava, M. E. and F. R. Engelhardt.** 1980. Compartmentalization of ingested labelled petroleum in tissues and bile of the American eel (*Anguilla rostrata*). *Bull. Environ. Contam. Toxicol.*

**24(6):879-885.**

Keywords : labelled, tissue, bile, accumulation, elimination, petroleum hydrocarbons, concentration, blood, heart, gill, muscle, brain, liver, kidney, fish, Othree, eel, crude oil, hydrocarbons, petroleum

[ Accumulation and elimination of labelled petroleum hydrocarbons from tissues and bile of the American eel; exposure by five daily doses at two petroleum concentrations, concentrations measured for 12 da in bile, liver, kidney, blood, heart, gill, muscle, and brain.]

**Nava, M. E. and F. R. Engelhardt.** 1982. Induction of mixed function oxidases by petroleum in the American eel, *Anguilla rostrata*. Arch. Environ. Contam. Toxicol. **11(2):141-145.**

Keywords : eel, liver, kidney, gill, muscle, intestine, heart, blood, brain, concentration, crude oil, fish, metabolism, Othree, fresh water, mixed-function oxidase, protein

[ Effects on induction of benzo(a)pyrene hydroxylase in liver, kidney, gill, muscle, intestine, heart, blood, and brain, and cytochrome P-450 in liver of American eels exposed to five daily doses of varying concentrations of crude oil; eels were monitored for 12 da after dosing. Also measured protein content of hepatic postmitochondrial fraction.]

**Neff, J. M., R. E. Hillman, R. S. Carr, R. L. Buhl, and J. I. Lahey.** 1987. Histopathologic and biochemical responses in Arctic marine bivalve molluscs exposed to experimentally spilled oil. Arctic **40(1):220-229.**

Keywords : biochemical, Arctic, bivalve, sublethal, experiment, spill, condition, tissue, pathology, salt water, Odfour, marine invertebrate

[ Assessment of the sublethal effects on two species of bivalve mollusc of experimental spills of chemically-dispersed and nondispersed crude oil. Part of the Baffin Island Oil Spill Project (BIOS). Sampled bivalves before exposure, immediately after exposure, 2 wks after exposure, and 1 yr after exposure. Determined histopathologic condition and measured a variety of soft tissue biochemicals.]

**Nelson, W. G.** 1981. Inhibition of barnacle settlement by Ekofisk crude oil. Mar. Ecol. -Prog. Ser. **5():41-43.**

Keywords : barnacle, larvae, crude oil, Ekofisk crude oil, intertidal, experiment, weathered, rocky shore, salt water, Ofour, marine invertebrate

[ Assesment of the effects of Ekofisk crude oil on barnacle settlement in the rocky intertidal zone. In one experiment, weathered (mechanical mixing with seawater for 3 d) crude oil was applied as either 2 l per m<sup>2</sup> or three consecutive daily applications of 0.67 l per m<sup>2</sup>. In a second experiment, weathered oil was applied as 2 l per m<sup>2</sup> and scraped off after 1 hr. Measured the amount of larval settlement after 3, 4, 5, 9, and 27 da.]

**Nevissi, A. E. and R. E. Nakatani.** 1990. Effects of crude oil spill on homing migration of Pacific salmon. The Northwest Environmental J. **6(1):79-84.**

Keywords : crude oil, spill, homing, Pacific, salmon, behavior, dispersant, fish, species, ODthree, salt water, review, research

[ Overview of research conducted on the effect of crude oil and chemically dispersed crude oil on the homing behavior of Pacific salmonids; some of the work was performed by the authors.]

**Newton, L. C. and J. D. McKenzie.** 1995. Echinoderms and oil pollution: a potential stress assay using bacterial symbionts. *Mar. Pollut. Bull.* **31**(4-12):453-456.

Keywords : echinoderm, assay, bacteria, symbiotic, North Sea, spill, tissue, drilling mud, brittlestar, salt water, Ofour, marine invertebrate

[ Evaluation of the effect of oil contamination on the symbiotic bacteria of three species of echinoderms (brittlestars). In one experiment, brittlestars were exposed to 1/10, 1/100, or 1/1000 dilutions of oil-based drill cuttings for 2 wk; cuttings were replaced daily. In a second experiment, one brittlestar was subjected to a single exposure of a 1/1000 dilution and monitored for 2 wk. In addition, all three species were collected from sites in the North Sea following the *Braer* oil spill. Measured the number of bacteria per unit weight of homogenized arm tissue.]

**Nicholson, G. J., T. Theodoropoulos, and G. J. Fabris.** 1994. Hydrocarbons, pesticides, PCB and PAH in Port Phillip Bay (Victoria) sand flathead. *Marine Pollut. Bull.* **28**(2):115-120.

Keywords : survey, petroleum hydrocarbons, muscle, liver, fish, Australia, salt water, Othree, petroleum, hydrocarbons, PCB

[ Results of a survey of the petroleum hydrocarbons, pesticides, PCBs, and select PAHs in muscle and liver of sand flathead fish from Port Phillip Bay, Australia.]

**Nicol, J. A. C., W. H. Donahue, R. T. Wang, and K. Winters.** 1977. Chemical composition and effects of water extracts of petroleum on eggs of the sand dollar *Melitta quinquesperforata*. *Mar. Biol.* **40**():309-316.

Keywords : eggs, No.2 fuel oil, fuel oil, Kuwait crude oil, crude oil, sperm, aromatic hydrocarbons, fertilization, development, motility, oxygen, uptake, permeability, respiration, salt water, Ofour, marine invertebrate, effects, Kuwait, sand, aromatic, hydrocarbons, water

[ Determined the effects of water-soluble fractions (WSF) of No. 2 fuel oil and Kuwait crude oil on the eggs and sperm of sand dollars. Eggs and sperm were exposed to 50% Kuwait WSF or 2 - 50% No. 2 fuel oil WSF. Measured the aromatic hydrocarbon content of the fuel oil WSF, permeability of exposed eggs to water, fertilization, cleavage, larval development, motility of sperm, and oxygen uptake of sperm.]

**Nicolotti, G. and S. Egli.** 1998. Soil contamination by crude oil: impact on the mycorrhizosphere and on the revegetation potential of forest trees. *Environ. Pollut.* **99**(1):37-43.

Keywords : soil, crude oil, concentration, growth, length, biomass, poplar, spruce, fungi, colonization, Oseven, fresh water, freshwater plant

[ Effects of various concentrations of crude oil in soil (0.1, 1, 5, 10, 20, 50 g/kg) on the growth of seedlings of Norway spruce and poplar and on the ability of ectomycorrhizal fungi to colonize the seedlings. Tested 10 species of fungi. All tests conducted at 0-42 da post oil contamination. Measured shoot length and biomass and percent colonization of roots.]

**Nisbet, I. C. T.** 1975. Conservation of marine birds in northern North America -- a summary. Anonymous. *Conservation of Marine Birds in Northern North America*, pp.1-16.

Keywords : conservation, marine birds, bird, population, North America, spill, salt water, Oone

[ Summary of a conference dedicated to assessing the status of marine birds in North America; oil pollution is mentioned as the primary anthropogenic threat to bird populations.]

**Nulton, C. P. and D. E. Johnson.** 1981. Aromatic hydrocarbons in marine tissues from the central Gulf of Mexico. *J. Environ. Sci. Health* **A16**(3):271-288.

Keywords : aromatic hydrocarbons, tissue, Gulf of Mexico, muscle, fish, liver, gill, gonads, crude oil, concentration, marine invertebrate, species, Othree, shrimp, oyster, crab, salt water, aromatic, hydrocarbons, macroinvertebrate, Mexico, baseline, condition

[ Assessment of aromatic hydrocarbons in the muscle of demersal fish and macroinvertebrates and the muscle, liver, and gill or gonads from pelagic fish sampled from the northern Gulf of Mexico; purpose was to establish a baseline condition before extensive oil drilling.]

**Nunes, P. and P. E. Benville,Jr.** 1978. Acute toxicity of the water-soluble fraction of Cook Inlet crude oil to the Manila clam. *Mar. Pollut. Bull.* **9**(3):324-331.

Keywords : acute, toxicity, Cook Inlet crude oil, crude oil, clam, methods, bioassay, benzene, static, concentration, aromatic hydrocarbons, survival, salt water, Ofour, marine invertebrate, water, aromatic, hydrocarbons

[ Determination of the acute toxicity to Manila clams of the water-soluble fraction (WSF) of Cook Inlet crude oil. Investigators employed experimental exposure methods; a 14-da continuous-flow bioassay using the WSF, a 96-hr continuous-flow bioassay using benzene only, a 96-hr continuous-flow bioassay using WSF and clams from a pristine and a polluted area, a 96-hr static bioassay using WSF, and an 8-da continuous-flow bioassay using WSF. Measured water concentrations of six aromatic hydrocarbons and survival of clams.]

**Nunes, P. and P. E. Benville,Jr.** 1979. Uptake and depuration of petroleum hydrocarbons in the Manila clam, *Tapes semidecussata* Reeve. *Bull. Environ. Contam. Toxicol.* **21**(6):719-726.

Keywords : uptake, depuration, petroleum hydrocarbons, clam, Cook Inlet crude oil, crude oil, bioassay, concentration, aromatic hydrocarbons, tissue, salt water, Ofour, marine invertebrate

[ Evaluation of the uptake and depuration of Manila clams exposed to the water-soluble fraction (WSF) of Cook Inlet crude oil. Clams exposed to WSF in a continuous-flow bioassay for 8 da followed by 14 da of depuration. Measured concentrations of six aromatic hydrocarbons in the water and in clam soft tissue.]

**Nwokolo, E. and L. O. C. Ohale.** 1986. Growth and anatomical characteristics of pullet chicks fed diets contaminated with crude petroleum. *Bull. Environ. Contam. Toxicol.* **37**(3):441-447.

Keywords : Oone, chicks, diet, chicken, crude oil, survival, weight, organ, bird, feeding, concentration

[ Results of feeding chicks (chickens) diets containing varying concentrations of crude oil; survival, body weight, and organ weights were measured.]

**O'Clair, C. E. and S. D. Rice.** 1985. Depression of feeding and growth rates of the seastar *Evasterias troschelii* during long-term exposure to the water-soluble fraction of crude oil. *Mar. Biol.* **84**(3):331-340.

Keywords : feeding, growth, rate, crude oil, Cook Inlet crude oil, mussel, concentration, flow-through, bioassay, aromatic hydrocarbons, survival, weight, gonads, salt water, Ofour, marine invertebrate

[ Determined the effects of the water-soluble fraction (WSF) of Cook Inlet crude oil on the feeding and growth rates of a seastar. The seastar predator and its prey (mussel) were exposed to six concentrations of WSF for 28 da in a flow-through bioassay. Measured concentrations of 10 aromatic hydrocarbons in the water, survival of seastars, feeding characteristics, growth rates, and weights of seastar pyloric caeca and gonads.]

**Ogata, M., Y. Miyake, S. Kira, K. Matsunaga, and M. Imanaka.** 1977. Transfer to fish of petroleum paraffins and organic sulfur compounds. *Water Res.* **11**(4):333-338.

Keywords : fish, paraffin, organic sulfur, eel, Arabian Light crude oil, crude oil, accumulation, monoaromatic, fresh water, Othree, organoleptic, light, organic, sulfur

[ Exposure of eels to Arabian Light crude oil and the subsequent accumulation of straight and branched chain paraffins, monoaromatics, and organic sulfur compounds; eels exposed for up to 15 da, organoleptic test also.]

**Okoh, A. I., G. O. Babalola, and M. K. Bakare.** 1996. Microbial densities and physicochemical quality of some crude oil flow stations' saver pit effluents in the Niger Delta areas of Nigeria. *Sci. Total Environ.* **187**(2):73-78.

Keywords : density, crude oil, effluent, Nigeria, wastewater, microbes, chemical analysis, Oten, fresh water, miscellaneous, region

[ Examination of saver pit effluents from crude oil flow stations in the Niger Delta region of Nigeria. Measured wastewater characteristics and microbial densities during October, November, December, and January.]

**Olivera, F. L., R. C. Loehr, B. C. Coplin, H. Eby, and M. T. Webster.** 1998. Prepared bed land treatment of soils containing diesel and crude oil hydrocarbons. *J. Soil Contam.* **7**(6):657-674.

Keywords : treatment, soil, crude oil, diesel fuel, petroleum hydrocarbons, bioremediation, Oten, miscellaneous, toxicity

[ A field-scale, prepared-bed land treatment unit was used to bioremediate soil containing 30-40 yr-old crude oil and soil containing 3-yr-old diesel fuel. Both soils were fertilized and sampled monthly for total petroleum hydrocarbon analysis, a suite of soil characteristics, and tested for toxicity (Microtox). The treatment units were operated for slightly more than a year for both soils.]

**Olla, B. L., A. J. Bejda, and W. H. Pearson.** 1983. Effects of oiled sediment on the burrowing behaviour of the hard clam, *Mercenaria mercenaria*. *Mar. Environ. Res.* **9**(1):183-193.

Keywords : oiled, sediment, burrowing, Prudhoe Bay crude oil, crude oil, behavior, juvenile, clam, sand, concentration, rate, depth, salt water, Ofour, marine invertebrate

[ Evaluation of the effect of Prudhoe Bay crude oil on the burrowing behavior of juvenile hard clams. Two identical experiments were performed wherein the clams were placed in sand containing 10,000 ppm crude oil. Exposure lasted for 96 hr followed by removal to clean sand for another 96 hr. Measured total oil concentration in sand substrate, rate of clam burrowing, and depth of burial after 96

hr.]

**Olla, B. L., A. J. Bejda, A. L. Studholme, and W. H. Pearson.** 1984. Sublethal effects of oiled sediment on the sand worm, *Nereis (Neanthes) virens*: induced changes in burrowing and emergence. Mar. Environ. Res. **13**(1):121-139.

Keywords : sublethal, oiled, sediment, sand, burrowing, emergence, behavior, Prudhoe Bay crude oil, crude oil, concentration, weathered, transfer, petroleum hydrocarbons, salt water, Ofour, marine invertebrate

[ Evaluation of the effect on the burrowing behavior of sand worms of exposure to Prudhoe Bay crude oil. Two experiments were conducted. One experiment used two concentrations of fresh crude oil weathered in the aquarium for 24 hr before the sand worms were introduced to oiled sediment for 96 hrs. A second experiment used five concentrations of crude oil weathered for 24 to 240 hr before sand worm introduction for 12 hrs. Worms from both experiments were subsequently removed and transferred to clean sand for further observation. Measured total hydrocarbons in the sand, emergence and burrowing behavior during oil exposure, and emergence and burrowing behavior after transfer to clean sand.]

**Olson, J. J., G. L. Mills, B. E. Herbert, and P. J. Morris.** 1999. Biodegradation rates of separated diesel components. Environ. Toxicol. Chem. **18**(11):2448-2453.

Keywords : biodegradation, rate, diesel, diesel fuel, petroleum hydrocarbons, alkane, aromatic, concentration

[ Determination of biodegradation rates for three classes of hydrocarbons in diesel fuel. Fractionated diesel fuel into *n*-alkanes, branched and cyclic alkanes, aromatics, and a composite of the fractions. The hydrocarbon mixtures were each subjected to a 35-da microbial batch culture experiment. Measured hydrocarbon concentrations during the test period.]

**Onianwa, P. C.** 1995. Petroleum hydrocarbon pollution of urban topsoil in Ibadan City, Nigeria. Environ. Internat. **21**(3):341-343.

Keywords : petroleum hydrocarbons, Nigeria, concentration, soil, urban, Oten, miscellaneous, hydrocarbons

[ Measurement of the concentration of total hydrocarbons in topsoil from seven types of areas within Ibadan City, Nigeria.]

**Onwumere, B. G. and A. A. Oladimeji.** 1990. Accumulation of metals and histopathology in *Oreochromis niloticus* exposed to treated NNPC Kaduna (Nigeria) petroleum refinery effluent. Ecotox. Environ. Safety **19**(2):123-134.

Keywords : accumulation, metals, Nigeria, refinery, effluent, fingerling, acute, long-term, concentration, survival, growth, pathology, fish, fresh water, Othree, petroleum

[ Effects on tilapia fingerlings of acute (96 hr) or long-term (8 wk) exposure to varying concentrations of petroleum refinery effluent for 96 hr; survival, growth, pathology, and metal accumulation.]

**Orbell, J. D., E. K. Tan, M. Coutts, S. W. Bigger, and L. N. Ngeh.** 1999. Cleansing oiled feathers -- magnetically. Mar. Pollut. Bull. **38**(3):219-221.

Keywords : oiled, feathers, petroleum, bird, crude oil, motor oil, emulsion, cleaning, structure, Oone, salt water

[ Description of a method of removing petroleum from bird feathers that utilizes iron powder. Tested the method on three crude oils, a motor oil, and a crude oil-sea water emulsion. Measured removal of petroleum with each cleaning cycle and evaluated feather structure after cleaning was finished.]

**Ordzie, C. J. and G. C. Garofalo.** 1981. Lethal and sublethal effects of short term acute doses of Kuwait crude oil and a dispersant Corexit 9527 on bay scallops *Argopecten irradians* (Lamarck) and two predators at different temperatures. Mar. Environ. Res. **5**(3):195-210.

Keywords : lethal, sublethal, short-term, acute, scallop, Kuwait crude oil, crude oil, dispersant, Corexit 9527, temperature, starfish, oyster drill, bivalve, gastropod, survival, depuration, salt water, Odfour, marine invertebrate

[ Assessment of the effects on bay scallops, starfish, and oyster drill of the water-soluble fractions of Kuwait crude oil, Corexit 9527, and an oil:dispersant mixture. Survival of scallops was determined with six stock solutions varying from 6.25% to 100% at three water temperatures. Exposure lasted 6 hr followed by 5 da of depuration. Survival of starfish and oyster drill was determined with three stock solutions ranging from 12.5% to 100% at two and one water temperatures, respectively. A 5-da period of depuration followed. Scallop response to predators, starfish response times for predatory posturing, and oyster drill response to prey was determined with survivors from the 12.5% exposure at three, two, and one temperatures, respectively.]

**Ormond, R. F. G. and S. Caldwell.** 1982. The effect of oil pollution on the reproduction and feeding behavior of the sea anemone *Actinia equina*. Mar. Pollut. Bull. **13**(4):118-122.

Keywords : reproduction, feeding, behavior, North Sea crude oil, Kuwait crude oil, crude oil, adult, static, juvenile, paraffin, monoaromatic, gonads, salt water, Ofour, marine invertebrate

[ Investigators used four experiments to assess the effects of North Sea and Kuwait crude oils on a sea anemone. Experiment 1: adult anemone exposed to crude oils in a static aquaria test for 14 wks. Water and oil replaced weekly. Weekly counts made of the numbers of planulae and juveniles emitted by adults, behavior, and feeding response. Experiment 2: adult anemone exposed as in the first experiment to either crude oils, paraffins or monoaromatics. Experiment 3: adult anemone exposed to filter paper soaked in either fish extract, crude oil + fish extract, paraffins + fish extract, crude oil only, monoaromatics + fish extract, paraffins only, monoaromatics only, or seawater only. Experiment 4: gonads from the anemones in Exp. 1 were removed after 18 wks and examined histologically.]

**Ostazeski, S. A., S. C. Macomber, L. G. Roberts, A. D. Uhler, K. R. Bitting, and R.**

**Hiltabrand.** 1997. The environmental behavior of Orimulsion spilled on water. Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.469-477. Edition API #4651. American Petroleum Institute. Washington, DC.

Keywords : Orimulsion, composition, physical characteristics, weathered, fate, Onine, salt water, fresh water, technical, spill, behavior, water

[ Chemical composition, physical characteristics, behavior in fresh and salt water, and weathering of Orimulsion.]

**Oyewo, E. O.** 1986. The acute toxicity of three oil dispersants. *Environ. Pollut. (Ser. A)* **41**(1):23-31.

Keywords : acute, toxicity, dispersant, mullet, fingerling, crab, concentration, salinity, behavior, marine invertebrate, fish, ODthree, salt water

[ Effects on mullet fingerlings and hermit crabs of exposure to varying concentrations of three chemical dispersants (Conco-K, Foremost, BP 1100X) in two salinities; 24,48, and 96 hr LC50, behavior.]

**Padros, J., E. Pelletier, R. Siron, and D. Delille.** 1999. Fate of a new silicone-based oil-treating agent and its effects on marine microbial communities. *Environ. Toxicol. Chem.* **18**(5):819-827.

Keywords : fate, effects, community, degradation, petroleum, silicone, spill response, combination, concentration, bacteria, phytoplankton, Ofour, salt water, marine invertebrate, recovery

[ Evaluation of the effects of a silicone-based oil-treating agent on natural microbial communities and the degradation of petroleum. Used estuarine mesocosms over a 9-wk period. Treatments consisted of oil alone, agent alone, or a combination of the two. Measured several water quality characteristics, oil concentrations, bacteria, and phytoplankton.]

**Page, D. S., P. D. Boehm, G. S. Douglas, A. E. Bence, W. A. Burns, and P. J. Mankiewicz.** 1997. An estimate of the annual input of natural petroleum hydrocarbons to seafloor sediments in Prince William Sound, Alaska. *Mar. Pollut. Bull.* **34**(9):744-749.

Keywords : estimate, petroleum hydrocarbons, sediment, Prince William Sound, Alaska, annual, oil seep, salt water, Oten, miscellaneous, petroleum, hydrocarbons

[ Assessment of the annual deposition of natural petroleum hydrocarbons to ocean sediments in Prince William Sound, Alaska.]

**Page, D. S., P. D. Boehm, G. S. Douglas, A. E. Bence, W. A. Burns, and P. J. Mankiewicz.** 1998. Petroleum sources in the western Gulf of Alaska/Chukchi Sea area. *Mar. Pollut. Bull.* **36**(12):1004-1012.

Keywords : Alaska, baseline, crude oil, tar ball, sediment, aromatic hydrocarbons, saturated hydrocarbons, Gulf of Alaska, salt water, Oten, miscellaneous

[ Evaluation of the sources of petroleum in the western Gulf of Alaska to establish baseline conditions. Analyzed 15 sources (crude oil, tar balls, sediment, oil-in-water) of petrogenic hydrocarbons for saturate and aromatic hydrocarbons.]

**Page, D. S., P. D. Boehm, G. S. Douglas, A. E. Bence, W. A. Burns, and P. J. Mankiewicz.** 1999. Pyrogenic polycyclic aromatic hydrocarbons in sediments record past human activity: a case study in Prince William Sound, Alaska. *Mar. Pollut. Bull.* **38**(4):247-260.

Keywords : aromatic hydrocarbons, sediment, humans, activity, Prince William Sound, Alaska, sources, weathered, Exxon Valdez, pyrogenic, Oten, salt water, miscellaneous

[ Determination of the sources of polycyclic aromatic hydrocarbons (PAH) in the nearshore sediments of western Prince William Sound, Alaska. Samples collected from 1989 to 1992. Results of chemical analyses compared to PAH profiles for weathered Exxon Valdez oil, average petrogenic background, creosote, weathered Monterey oil, wood burning, and human habitation. Used 'source allocation analysis' to determine the proportional sources of PAH for 5 locations in the Sound.]



**Page, G. W., H. R. Carter, and R. G. Ford.** 1990. Numbers of seabirds killed or debilitated in the 1986 *Apex Houston* oil spill in central California. *Studies in Avian Biol.* **14**(1):164-174.

Keywords : estimate, spill, carcass, model, bird, crude oil, population, salt water, Oone, California, numbers, coast

[ An estimation, by carcass deposition model, of the number of birds killed or debilitated by the Apex Houston crude oil spill off the coast of central California.]

**Paine, M. D., W. C. Leggett, J. K. McRuer, and K. T. Frank.** 1991. Effects of incubation in oiled sediment on emergence of capelin (*Mallotus villosus*) larvae. *Can. J. Fish. Aquat. Sci.* **48**(11):2228-2239.

Keywords : oiled, sediment, larvae, eggs, crude oil, hatching, growth, Hibernia crude oil, emergence, fish, Othree, salt water

[ Effect on capelin eggs of exposure to sediment contaminated with Hibernia crude oil for 28 da; hatching and emergence success, larval growth.]

**Paine, R. T., L. Ruesink, A. Sun, E. L. Soulanille, M. J. Wonham, C. D. G. Harley, D. R. Brumbaugh, and D. L. Secord.** 1996. Trouble on oiled waters: Lessons from the *Exxon Valdez* oil spill. Fautin DG, Futuyma DJ, and James FC (eds.), *Annual Review of Ecology and Systematics*, pp.197-235. Vol. 27. Annual Reviews, Inc.

Keywords : oiled, Exxon Valdez, spill, injury, research, crude oil, miscellaneous, Oten, salt water, mammal, bird, fish, marine invertebrate, marine plant, restoration, activity

[ Critical assessment of the Exxon Valdez oil spill response and the associated injury assessment studies. Concludes with recommendations for future research activity.]

**Parnell, J. F., M. A. Shields, and D. Frierson, Jr.** 1984. Hatching success of brown pelican eggs after contamination with oil. *Colonial Waterbirds* **7**(1):22-24.

Keywords : hatching, brown pelican, eggs, spill, Bunker C, fuel oil, salt water, Oone, endangered species, bird, oiling, pelican

[ Account of the oiling of endangered brown pelican eggs by a spill of Bunker C fuel oil on the Cape Fear River in North Carolina.]

**Parr, S. J., R. J. Haycock, and M. E. Smith.** 1997. The impact of the *Sea Empress* oil spill on birds of the Pembrokeshire coast and islands. Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.217-225. Edition API #4651. American Petroleum Institute. Washington, DC.

Keywords : spill, bird, species, composition, population, estimate, Oone, salt water, Wales, coast, numbers

[ Report of the effects of the Sea Empress oil spill on birds along the coast of southwest Wales. Description of the numbers and species composition of dead birds and the results of population counts before and after the spill in nearby areas. Estimates of the population consequences of the spill.]

**Parrish, J. K. and P. D. Boersma.** 1995. Muddy waters. *Am. Sci.* **83**(2):112-115.

Keywords : estimate, Exxon Valdez, spill, common murre, population, Prudhoe Bay crude oil, crude

oil, species, bird, salt water, Oone

[ Discussion critical of the high estimates of seabird deaths caused by the Exxon Valdez oil spill; special detail for the common murre.]

**Parsons, K. C.** 1994. The Arthur Kill oil spills: biological effects in birds. J. Burger (ed.), Before and After an Oil Spill: the Arthur Kill, pp.215-237. Rutgers Univ. Press, New Brunswick.

Keywords : spill, bird, New Jersey, New York, wintering, population, foraging, reproduction, salt water, Oone, activity

[ Effects on birds of the multiple oil spills occurring in the Arthur Kill and Kill van Kull between New Jersey and New York during 1990. Assessments of wintering and breeding bird populations, reproductive activity, and foraging activity.]

**Parsons, K. C.** 1996. Recovering from oil spills: the role of proactive science in mitigating adverse effects. Colonial Waterbirds **19**(1):149-153.

Keywords : spill, New York, New Jersey, salt water, Oone, bird, fish, marine invertebrate, shrimp, government, database, survey, commentary, baseline

[ Commentary on the usefulness of good baseline information for assessing the effects of the multiple oil spills occurring in the harbor area between New York and New Jersey in 1990.]

**Parsons, T. R., P. J. Harrison, J. C. Acreman, H. M. Dovey, P. A. Thompson, and C. M. Lalli.** 1984. An experimental marine ecosystem response to crude oil and Corexit 9527: part 2 --biological effects. Mar. Environ. Res. **13**(3):265-275.

Keywords : crude oil, Corexit 9527, Prudhoe Bay crude oil, dispersant, nitrate, chlorophyll, productivity, phytoplankton, bacteria, glucose, population, zooplankton, mesocosm, salt water, ODFour, marine invertebrate

[ Evaluation of the biological effects in a pelagic ecosystem of Prudhoe Bay crude oil, with or without a chemical dispersant (Corexit 9527). Three large mesocosms were used and samples were collected every 2-3 da beginning the day before treatment and ending 17 or 18 da after treatment. Measured nitrate and nitrite, silicate, chlorophyll *a*, primary productivity (phytoplankton), bacteria, relative heterotrophic uptake (glucose production), and changes in populations of four categories of phytoplankton and zooplankton.]

**Pattee, O. H. and J. C. Franson.** 1982. Short-term effects of oil ingestion on American kestrels (*Falco sparverius*). J. Wildl. Dis. **18**(2):235-241.

Keywords : ingestion, toxicity, weathered, crude oil, pathology, physiology, fresh water, Oone, raptor, bird

[ Evaluation of the toxicity of ingested weathered oil from the Ixtoc well blowout to American kestrels.]

**Patten, S. M., Jr. and L. R. Patten.** 1978. Effects of petroleum exposure on the breeding ecology of the Gulf of Alaska herring gull group (Larus argentatus x Larus glaucescens). D. A. Wolfe (ed.), Marine Biological Effects of OCS Petroleum Development, pp.199-215. National Oceanic and Atmospheric Administration, Washington.

Keywords : Alaska, herring gull, gull, petroleum development, salt water, reproduction, Oone, eggs,

North Slope crude oil, crude oil, glaucous-winged gull, oiled, bird, species, oiling, North Slope  
[ Effects on reproduction of two gull species of egg oiling with North Slope crude oil.]

**Patton, J. F. and M. P. Dieter.** 1980. Effects of petroleum hydrocarbons on hepatic function in the duck. *Comp. Biochem. Physiol.* **65C**():33-36.

Keywords : hydrocarbons, duck, liver, mallard, diet, aromatic, paraffin, physiology, Oone, bird  
[ Assessment of liver function of mallard ducks fed diets containing paraffin or aromatic mixtures.]

**Payne, J. F.** 1975. Field evaluation of benzopyrene hydroxylase induction as a monitor for marine petroleum pollution. *Science* **191**(4230):945-946.

Keywords : fish, cunner, salt water, Othree, Newfoundland, metabolism, petroleum hydrocarbons, monitoring, petroleum  
[ Results of a field test of the utility of benzopyrene hydroxylase induction as an indicator of the presence of petroleum pollution.]

**Payne, J. F.** 1977. Mixed function oxidases in marine organisms in relation to petroleum hydrocarbon metabolism and detection. *Mar. Pollut. Bull.* **8**(5):112-116.

Keywords : petroleum hydrocarbons, metabolism, survey, Atlantic, flow-through, Venezuelan crude oil, crude oil, mixed-function oxidase, salt water, Ofour, marine invertebrate, activity, petroleum  
[ Survey of basal mixed function oxidase (MFO) activity in marine organisms of the northwest Atlantic and attempts to induce MFO activity in the same organisms. Used flow-through aquaria treated with emulsified Venezuelan crude oil for exposures of 1 wk. Intent was to identify organisms for use as monitors of petroleum pollution.]

**Payne, J. F.** 1982. Critique of "Petroleum and marine fishes: a review of uptake disposition and effects". *Environ. Sci. Technol.* **16**(6):370-372.

Keywords : review, uptake, fish, accumulation, metabolism, population, survival, salt water, critique, Othree, petroleum  
[ A critical review of the publication "Petroleum and marine fishes: a review of uptake disposition and effects" by D.C. Malins and H.O. Hodgins, 1981, *Environ. Sci. Technol.* 15:1272.]

**Payne, J. F. and L. L. Fancey.** 1982. Effect of long term exposure to petroleum on mixed function oxygenases in fish: further support for use of the enzyme system in biological monitoring. *Chemosphere* **11**(2):207-213.

Keywords : long-term, fish, enzyme, monitoring, mixed-function oxidase, crude oil, sediment, salt water, codfish, sculpin, flounder, metabolism, Othree, Venezuelan crude oil, petroleum, time, water

[ Assessment of the utility of mixed-function oxidase induction as an indicator of petroleum pollution (Venezuelan crude oil) over long periods of time; codfish, sculpins, flounder, 3-5 mo exposure in a laboratory environment, contaminated water and sediment.]

**Payne, J. F., L. L. Fancey, J. Hellou, M. J. King, and G. L. Fletcher.** 1995. Aliphatic hydrocarbons in sediments: a chronic toxicity study with winter flounder (*Pleuronectes americanus*)

exposed to oil well drill cuttings. Can. J. Fish. Aquat. Sci. **52**(12):2724-2735.

Keywords : aliphatic, petroleum hydrocarbons, sediment, chronic, toxicity, winter flounder, flounder, concentration, fish, weight, organ, condition, biochemistry, blood, pathology, salt water, Othree, hydrocarbons, drilling fluids, experiment

[ Assessment of the effects of aliphatic hydrocarbons (from drilling fluids in drill cuttings) on winter flounder in an 80 da chronic exposure experiment; concentrations in fish and sediment, weight, organ condition, biochemistry, mixed-function oxygenase induction, blood characteristics, pathology.]

**Payne, J. F., J. Kiceniuk, and R. Misra.** 1983. Sublethal effects of petroleum hydrocarbons on adult American lobsters (*Homarus americanus*). Can. J. Fish. Aquat. Sci. **40**(6):705-717.

Keywords : petroleum hydrocarbons, sublethal, adult, lobster, Venezuelan crude oil, crude oil, flow-through, weathered, organ, weight, condition, blood, water, red blood cell, amino acids, plasma, salt water, Ofour, marine invertebrate

[ Evaluation of the effects of Venezuelan crude oil on American lobsters held in a large flow-through aquarium. Crude oil was added weekly, after removal of weathered surface oil, to the surface of the aquarium. After 14 wks of exposure, measured body and organ weights, condition indices, blood plasma constituents, blood electrolytes, water content, red blood cell characteristics, and plasma amino acids and their analogs.]

**Peakall, D. B., D. Hallett, D. S. Miller, R. G. Butler, and W. B. Kinter.** 1980. Effects of ingested crude oil on black guillemots: a combined field and laboratory study. Ambio **9**(1):28-30.

Keywords : crude oil, guillemot, weathered, South Louisiana crude oil, growth, pathology, physiology, dosed, salt water, Oone, bird, black guillemot, Louisiana

[ Effects on young black guillemots of single doses of weathered South Louisiana crude oil; growth, physiological measures, and some pathology.]

**Peakall, D. B., D. J. Hallett, J. R. Bend, G. L. Foureman, and D. S. Miller.** 1982. Toxicity of Prudhoe Bay crude oil and its aromatic fractions to nestling herring gulls. Environ. Res. **27**():206-215.

Keywords : toxicity, Prudhoe Bay crude oil, crude oil, aromatic, herring gull, gull, Corexit 9527, nestling, salt water, ODone, weight, organ, physiology, liver, dispersant, bird, herring, Prudhoe Bay

[ Effects on nestling herring gulls of single doses of Prudhoe Bay crude oil, Prudhoe Bay fractions, crude oil mixed with Corexit 9527, or Corexit 9527 alone.]

**Peakall, D. B., D. A. Jeffrey, and D. S. Miller.** 1985. Weight loss of herring gulls exposed to oil and oil emulsion. Ambio **14**(2):108-110.

Keywords : weight, herring gull, gull, experiment, Prudhoe Bay crude oil, crude oil, Corexit 9527, physiology, salt water, ODone, dispersant, bird, herring, Prudhoe Bay, oiling, feathers

[ Experiment 1: Effects on food-deprived fledgling herring gulls of single doses of Prudhoe Bay crude oil, crude oil plus Corexit 9527, or Corexit 9527. Experiment 2: Effects on fledgling herring gulls of oiling breast feathers with Prudhoe Bay crude oil or crude oil plus Corexit 9527.]

**Peakall, D. B., D. S. Miller, and W. B. Kinter.** 1979. Physiological techniques for assessing the impact of oil on seabirds. E. E. Kenaga (ed.), *Avian and Mammalian Wildlife Toxicology*, pp.52-60. American Society for Testing and Materials, Philadelphia, PA.

Keywords : methods, spill, herring gull, black guillemot, physiology, salt water, Oone, organ, weight, bird

[ Proposed methods for the physiological assessment of seabird "wrecks" to determine the role of oil spills in the observed death and debilitation.]

**Peakall, D. B., D. S. Miller, and W. B. Kinter.** 1983. Toxicity of crude oils and their fractions in nestling herring gulls -- 1. Physiological and biochemical effects. *Marine Environ. Res.* **8**(1):63-71.

Keywords : toxicity, crude oil, nestling, herring gull, gull, physiology, South Louisiana crude oil, aliphatic, aromatic, growth, weight, salt water, Oone, bird, herring, Louisiana

[ Effects on nestling herring gulls of single doses of South Louisiana crude oil and its aliphatic and aromatic fractions; growth and physiological characteristics measured.]

**Peakall, D. B., R. J. Norstrom, D. A. Jeffrey, and F. A. Leighton.** 1989. Induction of hepatic mixed function oxidases in the herring gull (*Larus argentatus*) by Prudhoe Bay crude oil and its fractions. *Comp. Biochem. Physiol.* **94C**(2):461-463.

Keywords : herring gull, gull, crude oil, liver, nestling, Prudhoe Bay crude oil, aromatic, aliphatic, physiology, metabolism, salt water, Oone, bird, herring, Prudhoe Bay

[ Effects on liver function of nestling herring gulls from single doses of Prudhoe Bay crude oil or their aromatic and aliphatic fractions.]

**Peakall, D. B., J. Tremblay, W. B. Kinter, and D. S. Miller.** 1981. Endocrine dysfunction in seabirds caused by ingested oil. *Environ. Res.* **24**(1):6-14.

Keywords : endocrine, species, South Louisiana crude oil, crude oil, aliphatic, aromatic, Prudhoe Bay crude oil, bird, physiology, growth, salt water, Oone, Louisiana, Prudhoe Bay

[ Effects on endocrine function of three species of seabirds from single doses of South Louisiana crude oil, its aliphatic or aromatic fractions, or Prudhoe Bay crude oil.]

**Peakall, D. B., P. G. Wells, and D. Mackay.** 1987. A hazard assessment of chemically dispersed oil spills and seabirds. *Marine Environ. Res.* **22**(1):91-106.

Keywords : spill, dispersant, hazard, vulnerability, toxicity, salt water, ODone, bird

[ Assessment of the positive and negative aspects of chemically dispersed oil spills with regard to the effects on seabirds.]

**Pearson, W. H., S. E. Miller, and J. W. Blaylock.** 1981. Detection of the water-soluble fraction of crude oil by the blue crab, *Callinectes sapidus*. *Mar. Environ. Res.* **5**(1):3-11.

Keywords : detection, crude oil, blue crab, crab, juvenile, Prudhoe Bay crude oil, flow-through, concentration, rate, antennule, behavior, salt water, Ofour, marine invertebrate

[ Determination of the ability of juvenile blue crabs to detect the water-soluble fraction (WSF) of Prudhoe Bay crude oil. Used a flow-through system with fresh WSF mixed daily. Measured water

concentration of WSF and antennular flicking rate of the crabs.]

**Pearson, W. H., P. C. Sugarman, D. L. Woodruff, and J. W. Blaylock.** 1980. Detection of petroleum hydrocarbons by the Dungeness crab, *Cancer magister*. Fish. Bull. **78**(3):821-826.  
Keywords : detection, petroleum hydrocarbons, crab, static, Prudhoe Bay crude oil, crude oil, naphthalene, concentration, aromatic, rate, behavior, salt water, Ofour, marine invertebrate  
[ Determination of the detection ability of Dungeness crabs for petroleum in the water. Crabs were exposed with a static test system to either the water-soluble fraction (WSF) of Prudhoe Bay crude oil or a saturated solution of naphthalene in water. Measured the WSF in water for concentrations of one, two, and three-ringed aromatics and measured the antennular flicking rate of the crabs for 1 min before and after introduction of the WSF or naphthalene.]

**Pearson, W. H., P. C. Sugarman, D. L. Woodruff, and B. L. Olla.** 1981. Impairment of the chemosensory antennular flicking response in the dungeness crab, *Cancer magister*, by petroleum hydrocarbons. Fishery Bull. **79**(4):641-647.  
Keywords : crab, petroleum hydrocarbons, food, detection, Prudhoe Bay crude oil, crude oil, flow-through, clam, recovery, concentration, monoaromatic, rate, behavior, antennule, salt water, Ofour, marine invertebrate  
[ Determined the effect on food detection of dungeness crabs of exposure to the water-soluble fraction (WSF) of Prudhoe Bay crude oil. Exposure to the WSF was in a flow-through system for 24 hrs prior to presentation of clam extract. Clean seawater was then used for a subsequent 24 and 48 hr assessment of the recovery of the ability to detect the clam extract. In a second experiment, detection was tested after 1 hr on clean seawater. Measured water concentrations of total hydrocarbons and of monoaromatics, and antennular flicking rate of the crabs.]

**Pearson, W. H., D. L. Woodruff, and P. C. Sugarman.** 1981. Effects of oiled sediment on predation on the littleneck clam, *Protothaca staminea*, by the Dungeness crab, *Cancer magister*. Estuarine Coastal Shelf Sci. **13**(4):445-454.  
Keywords : oiled, sediment, predation, clam, crab, intertidal, Prudhoe Bay crude oil, crude oil, sand, depth, concentration, salt water, Ofour, marine invertebrate  
[ A field and a lab experiment were used to determine the effect of petroleum exposure on the predation of clams by a species of crab. In 13 da and 29 da field experiments, cage enclosures were placed in the intertidal zone and contained either oiled (1% Prudhoe Bay crude oil) or unoled sand and clams. In a 19 da laboratory experiment, clams were buried at two depths in either oiled or unoled sand prior to introduction of crabs. In a subsequent 21 da laboratory experiment, clams were introduced to oiled or unoled sand and permitted to burrow in the absence of crabs. Measured total oil concentration in the sand, predation of clams, and depth of clams in the sand.]

**Pearson, W. H., D. L. Woodruff, and P. C. Sugarman.** 1984. The burrowing behavior of sand lance, *Ammodytes hexapterus*: effects of oil-contaminated sediment. Mar. Environ. Res. **11**(1):17-32.

Keywords : burrowing, behavior, sand, sediment, Prudhoe Bay crude oil, crude oil, activity, oiled, monoaromatic, concentration, length, weight, salt water, Ofour, marine invertebrate, experiment,

flow-through, effects, Prudhoe Bay, water, hydrocarbons

[ Performed two laboratory experiments with flow-through aquaria to determine the effect of Prudhoe Bay crude oil on the burrowing activity of sand lance. In one experiment, sand lance were exposed to clean sand & clean water, clean sand & oiled water, oiled sand & clean water, or oiled water & oiled sand; nominal oil in sand was 1000 ppm. In the second experiment, sand lance were exposed to clean water & oiled sand at either 100, 1000, or 10,000 ppm oil. Measured total hydrocarbon and monoaromatic concentrations in sand and water and length and wet weight of sand lance. Sand lance activity was observed hourly for 4 da.]

**Pelletier, E. and R. Siron.** 1999. Silicone-based polymers as oil spill treatment agents. *Environ. Toxicol. Chem.* **18**(5):813-818.

Keywords : spill, petroleum, sand, shell, beach, rocky shore, recovery, spill response, silicone, treatment, polymer, Onine, salt water, technical

[ An experimental testing of the ability of silicone-based polymers to encapsulate and solidify petroleum spills. Tested on three surfaces; rough (rocks and bivalve shells), beach sand, and open water. Discusses chemical reactions, recovering efficiency, properties and environmental considerations, toxicological properties, and limitations of use.]

**Pena, E., J. E. Conde, and F. G. Montelongo.** 1996. Evaluation of *Osilinus attratus* as a bioindicator organism to monitor oil pollution in the Canary Islands. *Arch. Environ. Contam. Toxicol.* **31**(4):444-452.

Keywords : monitoring, petroleum, coast, aromatic hydrocarbons, petroleum hydrocarbons, bioindicator, alkane, salt water, Ofour, marine invertebrate

[ Evaluation of a marine wrinkle as a species suitable for monitoring petroleum pollution. Collected samples from three locations along the coast of Tenerife (Canary Islands) during 1990-91 and analyzed them for n-alkanes and aromatic hydrocarbons.]

**Pendoley, K.** 1992. Hydrocarbons in Rowley Shelf (Western Australia) oysters and sediments. *Mar. Pollut. Bull.* **24**(4):210-225.

Keywords : Australia, oyster, sediment, baseline, concentration, oilfield, aromatic, alkane, salt water, Ofour, marine invertebrate, hydrocarbons

[ Determination of baseline hydrocarbon concentrations in sediments and oysters of the Rowley Shelf of Western Australia prior to the initiation of drilling in several offshore oilfields. Collected oysters from 8 sites and sediments from 11 sites in 1986 and 1988. Analyzed sediments and oysters for n-alkanes and aromatics.]

**Percy, J. A.** 1976. Responses of Arctic marine crustaceans to crude oil and oil-tainted food. *Environ. Pollut.* **10**(2):155-162.

Keywords : crustacean, crude oil, food, amphipod, isopod, static, avoidance, weathered, pre-exposure, feeding, activity, oiled, behavior, salt water, Ofour, marine invertebrate

[ Assessment of the behavioral response of two marine amphipods and one marine isopod to three crude oils and oil-tainted food in static laboratory experiments. Determined the avoidance of fresh or weathered crude oil and the effect of pre-exposure on avoidance by measuring the occurrence of

crustaceans in the vicinity of "oil zones". Determined feeding response to tainted food by measuring feeding activity on oiled and unoiled food.]

**Percy, J. A.** 1977. Responses of Arctic marine benthic crustaceans to sediments contaminated with crude oil. *Environ. Pollut.* **13**(1):1-10.

Keywords : benthic, crustacean, sediment, crude oil, oiled, amphipod, isopod, concentration, distribution, behavior, salt water, Ofour, marine invertebrate

[ Assessment of the behavioral responses to oiled sediment of several marine amphipod and isopod species. Sediments were contaminated with four different concentrations of four crude oils (16 combinations). Crustaceans were offered contaminated and clean sediment for 1 or 2 hr, followed by a count of the distribution of individuals.]

**Percy, J. A. and T. C. Mullin.** 1977. Effects of crude oil on the locomotory activity of Arctic marine invertebrates. *Mar. Pollut. Bull.* **8**(2):35-40.

Keywords : crude oil, activity, marine invertebrate, amphipod, coelenterate, crustacean, concentration, recovery, short-term, behavior, salt water, Ofour

[ Assessment of the effect of exposure to crude oils on the water movement of a marine amphipod and a marine coelenterate. Crustaceans were exposed for 24 hrs to either of three concentrations of seawater dispersions of three crude oils. Locomotor activity after exposure was measured and scored. One assessment was done after a 24 hr recovery period. The coelenterate was also used in a short-term evaluation of activity inhibition wherein observations were made hourly for 6 hrs.]

**Perkins, J. S.** 1983. Oiled Magellanic penguins in Golfo San Jose, Argentina. *Mar. Pollut. Bull.* **14**(10):383-387.

Keywords : oiled, penguin, Argentina, reproduction, salt water, Oone, bird, coast

[ Report of oiled Magellanic penguins on the coast of Argentina.]

**Perrollaz, D. C. and J. A. Rash.** 1990. Analysis of sea otter (*Enhydra lutris*) fur for crude oil contamination. Anonymous. International Association of Aquatic Animal Medicine, pp.82-87.

Keywords : sea otter, fur, crude oil, spill, Prudhoe Bay crude oil, Alaska, mammal, Otwo, chromatography, salt water

[ Description of a procedure using thin layer chromatography and fur for identifying sea otters that have come in contact with spilled oil.]

**Perry, M. C., F. Ferrigno, and F. H. Settle.** 1978. Rehabilitation of birds oiled on two mid-Atlantic estuaries. *Proc. Ann. Conf. S. E. Assoc Fish & Wildl. Agencies* **32**():318-325.

Keywords : rehabilitation, bird, oiled, estuary, review, spill, salt water, Oone, Delaware, Chesapeake

[ Review of bird losses from oil spills in the Chesapeake and Delaware Bay estuaries between 1973-78 and the results of oiled-bird rehabilitation efforts.]

**Peters, E. C., P. A. Meyers, P. P. Yevich, and N. J. Blake.** 1981. Bioaccumulation and histopathological effects of oil on a stony coral. *Mar. Pollut. Bull.* **12**(10):333-339.



Keywords : coral, petroleum hydrocarbons, accumulation, No.2 fuel oil, fuel oil, flow-through, assay, depuration, tissue, gonads, sperm, ova, salt water, Ofour, marine invertebrate

[ Determination of hydrocarbon accumulation in corals exposed to either 0.1 or 0.5 ppm water-accomodated fractions (WAF) of No. 2 fuel oil in a flow-through assay. Corals were exposed for 12 wks; some colonies were exposed for 10 wks followed by 2 wks of depuration. Corals were sampled for tissue hydrocarbon analysis before, during, and after exposure. Also, examined corals at 2-wk intervals for tissue atrophy and presence of gonads, ova, or sperm.]

**Pezeshki, S. R., A. Jugsujinda, and R. D. Delaune.** 1998. Responses of selected U.S. Gulf Coast marsh macrophyte species to oiling and commercial cleaners. *Water Air Soil Pollut.* **107**(1-4):185-195.

Keywords : oiling, shoreline, crude oil, plant, South Louisiana crude oil, Arabian crude oil, cleaning, photosynthesis, respiration, dispersant, Corexit 9580, salt water, ODsix, marine plant, species, coast, Louisiana

[ Evaluation of the effectiveness of a shoreline cleaner (Corexit 9580) in removing crude oil from three species of Gulf Coast (USA) macrophytes. Plants were subjected to cleaner only, South Louisiana crude oil only, Arabian medium crude oil only, or crude oils followed by cleaning 2 da later with cleaner. Measured stomatal conductance, photosynthesis, and respiration.]

**Phillips, C., J. Clayton, J. Evans, and W. Hom.** 1998. Evidence for long-range transport of a low to medium molecular-weight petroleum product off central California, USA. *Environ. Toxicol. Chem.* **17**(9):1662-1672.

Keywords : petroleum products, California, suspended sediment, alkane, terpane, sterane, isoprenoid, transport, crude oil, Onine, salt water, technical, petroleum, sediment

[ Evaluation of possible long-range transport of a refined petroleum product used as a diluent in onshore platforms in Southern California. Suspended sediments from offshore areas analyzed for normal alkanes, isoprenoids, PAHs, terpanes, and steranes. Principal components analyzis used on data.]

**Phillips, J.** 1974. Oiled seabirds successfully cleaning their plumage. *British Birds* **67**(11):483

Keywords : oiled, cleaning, plumage, gull, England, salt water, Oone, bird, oiling

[ Report of the oiling and subsequent cleaning of an oiled Bonaparte's gull on coastal England. Written in response to a previously published article on the same subject.]

**Piatt, J. F., H. R. Carter, and D. N. Nettleship.** 1991. Effects of oil pollution on marine bird populations. White J, Frink L, Williams TM, and Davis RW (eds.), *The Effects of Oil on Wildlife*, pp.125-141. The Sheridan Press. Hanover, PA.

Keywords : marine birds, bird, population, spill, history, relation, salt water, Oone

[ Assessment of the effect of oil pollution on marine bird populations; discussion of the difficulties of association between spills and population status and presentation of several case histories.]

**Piatt, J. F. and C. J. Lensink.** 1989. *Exxon Valdez* bird toll. *Nature* **342**(6252):865-866.

Keywords : Exxon Valdez, bird, spill, population, Alaska, species, salt water, Oone

[ Early report on the estimation of bird losses from the Exxon Valdez oil spill and their population consequences.]

**Piatt, J. F., C. J. Lensink, W. Butler, M. Kendziorek, and D. R. Nysewander.** 1990. Immediate impact of the 'Exxon Valdez' oil spill on marine birds. *The Auk* **107**(2):387-397.

Keywords : Exxon Valdez, spill, marine birds, bird, Alaska, population, Prudhoe Bay crude oil, salt water, Oone

[ Early assessment of the losses of seabirds from the Exxon Valdez oil spill in Alaska.]

**Piatt, J. F. and T. I. Van Pelt.** 1997. Mass-mortality of guillemots (*Uria aalge*) in the Gulf of Alaska in 1993. *Marine Pollut. Bull.* **34**(8):656-662.

Keywords : guillemot, Alaska, carcass, persistence, estimate, bird, population, starvation, salt water, Oone, experiment, numbers

[ Report of large die-off of guillemots in the Gulf of Alaska during the first half of 1993. Carcass deposition and persistence experiments used to estimate true numbers of dead birds. Discussion of possible causes of deaths and comparisons made to other reports of large-scale seabird losses.]

**Piehl, M. F., J. G. Swistak, J. L. Pinckney, and H. W. Paerl.** 1997. Sub-lethal effects of coastal petroleum pollution on *Spartina alterniflora* stem epiphytes. *Chemosphere* **35**(11):2665-2674.

Keywords : Spartina, diesel fuel, short-term, long-term, concentration, weathered, chlorophyll, productivity, salt water, Osix, marine plant

[ Effects of diesel fuel on stem epiphytes of *Spartina alterniflora*. Portions of field-collected stems were subjected to either short-term (3 hr) or long-term (48 hr) exposure to varying concentrations (87-17,400 ppm short-term, 0.87-435 ppm long-term) of weathered diesel fuel. Measured N<sub>2</sub> fixation, primary productivity, and chlorophyll *a* concentrations.]

**Pierce, V.** 1991. Pathology of wildlife following a #2 fuel oil spill. White J and Frink L (eds.), *The Effects of Oil on Wildlife*, pp.58-66. The Sheridan Press. Hanover, PA.

Keywords : pathology, fuel oil, spill, bird, No.2 fuel oil, species, necropsy, salt water, Oone, New Jersey, New York, technical, condition

[ Results of the necropsy of birds killed in the No. 2 fuel oil spill between NJ and NY in 1990. Also, technical guidance for others who have to perform necropsies under such conditions.]

**Pineiro, M. E. A., M. A. L. Yusty, S. T. C. Gonzalez-Barros, and J. S. Lozano.** 1996. Aliphatic hydrocarbon levels in turbot and salmon farmed close to the site of the *Aegean Sea* oil spill. *Bull. Environ. Contam. Toxicol.* **57**(5):811-815.

Keywords : aliphatic, hydrocarbons, salmon, spill, fish, organoleptic, turbot, crude oil, concentration, Othree, salt water

[ Presence of aliphatic hydrocarbons in turbot and salmon from fish farms located close to the site of the Aegean Sea oil spill; sampling done over a two-year period, organoleptic results also reported.]

**Ponat, A.** 1988. Effects of water soluble crude oil fractions on cirral beat frequency in *Balanus*

*balanoides*. Bull. Environ. Contam. Toxicol. **41**(5):759-764.

Keywords : crude oil, concentration, Saudi Arabian crude oil, Arabian crude oil, barnacle, static, assay, salt water, behavior, feeding, Ofour, marine invertebrate

[ Determination of the effect of one concentration of water-soluble fraction of either Venezuelan or Saudi Arabian crude oil on the cirral beat frequency of a North Sea barnacle. Barnacles were exposed for 3 hrs in a static assay and then transferred to clean sea water for up to 5 da. Cirral beats counted before, during, and after exposure.]

**Pontasch, K. W. and M. A. Brusven.** 1988. Diversity and community comparison indices: assessing macroinvertebrate recovery following a gasoline spill. Water Res. **22**(5):619-626.

Keywords : community, recovery, spill, diversity, gasoline, freshwater invertebrate, macroinvertebrate, Ofive, fresh water, creek

[ Effects of a gasoline spill on macroinvertebrates in Woldl Lodge Creek, ID. Two diversity indices and seven community comparison indices were used over a 16-month period to compare the spill site with reference areas.]

**Poremba, K.** 1993. Influence of synthetic and biogenic surfactants on the toxicity of water-soluble fractions of hydrocarbons in sea water determined with the bioluminescence inhibition test. Environ. Pollut. **80**(1):25-29.

Keywords : surfactant, toxicity, Ekofisk crude oil, crude oil, naphthalene, concentration, bioluminescence, dispersant, salt water, ODfour, marine invertebrate, biogenic, weathered

[ Determined the effect of three biogenic and three synthetic surfactants on the toxicity of the water-soluble fractions of Ekofisk crude oil (weathered and unweathered), phenol, and naphthalene. Measured the concentration of naphthalene in water and the inhibition of microbial bioluminescence (Microtox test).]

**Potter, D., E. D. Booth, H. C. A. Brandt, R. W. Loose, R. A. J. Priston, A. S. Wright, and W. P. Watson.** 1999. Studies on the dermal and systemic bioavailability of polycyclic aromatic compounds in high viscosity oil products. Arch. Toxicol. **73**():129-140.

Keywords : aromatic hydrocarbons, benzo

[a]pyrene, viscosity, uptake, petroleum products, skin, humans, mouse, blood, Oten, miscellaneous, mammal

[ An assessment of the effect of viscosity on the uptake of hazardous components of petroleum products. Applied nine petroleum products of varying viscosity in either of two quantities to the bare skin of laboratory mice and *in vitro* human skin; exposure was maintained for 6 hrs. Petroleum products contained <sup>14</sup>C-labelled benzo(a)pyrene. Measured benzo(a)pyrene in mouse and human skin DNA and mouse blood.]

**Poulton, B. C., E. V. Callahan, R. D. Hurtubise, and B. G. Mueller.** 1998. Effects of an oil spill on leafpack-inhabiting macroinvertebrates in the Chariton River, Missouri. Environ. Pollut. **99**(1):115-122.

Keywords : spill, macroinvertebrate, crude oil, pipeline, species, benthic, density, diversity, Ofive, fresh water, freshwater invertebrate, Missouri, stream

[ Evaluation of a crude oil spill from a ruptured pipeline on the Chariton River, Missouri 1 yr after the spill. Artificial leaf packs composed of leaves from five species of trees were placed at two sites upstream and three sites downstream of the spill 1 mo and 13 mos after the spill. Measured six benthic metrics and the density and taxa richness for four functional groups (collectors, predators, scrapers, shredders).]

**Poulton, B. C., S. E. Finger, and S. A. Humphrey.** 1997. Effects of a crude oil spill on the benthic invertebrate community in the Gasconade river, Missouri. *Arch. Environ. Contam. Toxicol.* **33**(3):268-276.

Keywords : crude oil, spill, benthic, invertebrate, community, macroinvertebrate, diversity, sediment, fresh water, Ofive, freshwater invertebrate, pipeline, petroleum, hydrocarbons

[ Effects of a crude oil spill (pipeline rupture) on the benthic macroinvertebrate communities of the Gasconade River in Missouri. Study began several months after the spill and ended 18 mos after the spill. Sampled invertebrates, calculated community and diversity indices, and measured total petroleum hydrocarbons in sediments.]

**Prasad, M. S.** 1988. Sensitivity of branchial mucous to crude oil toxicity in a freshwater fish, *Colisa fasciatus*. *Bull. Environ. Contam. Toxicol.* **41**(5):754-758.

Keywords : crude oil, toxicity, fish, concentration, sublethal, pathology, gill, fresh water, lethal, Othree, India

[ Effects on the striped gourami of exposure to varying concentrations (lethal and sublethal) of a local crude oil; lethal exposure was 2-24 hr, sublethal exposure was 15 da, pathology of gills.]

**Prasad, M. S.** 1989. Effects of crude oil on the air-breathing organs of the striped gourami, *Colisa fasciatus*: a SEM study. *Ecotox. Environ. Safety* **18**(2):211-218.

Keywords : crude oil, organ, air-breathing, concentration, tissue, pathology, Othree, fresh water, fish, air

[ Effect on air breathing organs of the striped gourami of exposure to varying concentrations of crude oil; exposure ranged from 12 hr to 15 da, tissue examined by scanning electron microscope.]

**Price, A. R. G.** 1998. Impact of the 1991 Gulf War on the coastal environment and ecosystems: current status and future prospects. *Environ. Internat.* **24**(1/2):91-96.

Keywords : ecosystem, Arabian Gulf, spill, humans, coast, Gulf oil spill, recovery, Oeight, salt water, general effect

[ Assessment of the status of the Arabian Gulf 5 yrs after the Gulf War oil spill. Comments on the effects of the war and contemporary exploitation by humans of the coastal areas.]

**Price, A. R. G., C. P. Mathews, R. W. Ingle, and K. Al-rasheed.** 1993. Abundance of zooplankton and penaeid shrimp larvae in the western Gulf: analysis of pre-war (1991) and post-war data. *Mar. Pollut. Bull.* **27**():273-278.

Keywords : abundance, zooplankton, shrimp, larvae, density, Gulf oil spill, salt water, Ofour, marine invertebrate

[ Comparison of densities of zooplankton and penaeid shrimp larvae in 1992 with densities in 1976 or

1978. All sampling was performed at the same two nearshore sites in the western Gulf of Arabia.]

**Proffitt, C. E. and D. J. Devlin.** 1998. Are there cumulative effects in red mangroves from oil spills during seedling and sapling stages? *Ecol. Appl.* **8**(1):121-127.

Keywords : spill, mangrove, No.6 fuel oil, Bunker C, fuel oil, South Louisiana crude oil, crude oil, growth, previous exposure, salt water, Osix, marine plant, petroleum, Louisiana, plant

[ Assessment of the effects on red mangrove seedling propagules and saplings of multiple exposures to petroleum. Seedling propagules exposed to No. 6 fuel oil, monitored for effects for 34 mos, exposed to South Louisiana crude oil, and monitored for another 12 mos. Multiple measures of plant growth and comparisons made to evaluate level of exposure and significance of previous exposure to No. 6 fuel oil.]

**Quintero, S. and C. Diaz.** 1994. Aliphatic hydrocarbons in fish from the Canary Islands. *Marine Pollut. Bull.* **28**(1):44-49.

Keywords : aliphatic, hydrocarbons, fish, spill, refinery, tanker, concentration, salt water, Othree, species, baseline

[ Baseline information on aliphatic hydrocarbons in fish caught at the Canary Islands; a site of heavy tanker traffic, several recent oil spills, and an oil refinery.]

**Rahn, H., R. A. Ackerman, and C. V. Paganelli.** 1977. Humidity in the avian nest and egg water loss during incubation. *Physiological Zool.* **50**(4):269-283.

Keywords : eggs, water, incubation, relation, bird, humidity, nest, Oone

[ Description of the dynamics of water loss from the avian egg and the relation with nest humidity.]

**Rahn, H. and C. V. Paganelli.** 1990. Gas fluxes in avian eggs: driving forces and the pathway for exchange. *Comp. Biochem. Physiol.* **95A**(1):1-15.

Keywords : eggs, review, egg shell, pores, temperature, nest, incubation, behavior, Oone, bird, shell, numbers, condition

[ Review of gas movement through avian egg shells; discussion of pore number, egg temperature, nest conditions, and incubation behavior.]

**Ralph, P. J. and M. D. Burchett.** 1998. Impact of petrochemicals on the photosynthesis of *Halophila ovalis* using chlorophyll fluorescence. *Mar. Pollut. Bull.* **36**(6):429-436.

Keywords : chlorophyll, concentration, crude oil, Corexit 9527, dispersant, pigment, photosynthesis, Osix, marine plant, salt water, species, seagrass, combination

[ Exposure of a species of seagrass to three concentrations of the water-soluble fraction of Bass Strait crude oil, Corexit 9527, and a combination of crude oil and dispersant for 96 hr. Measured chlorophyll fluorescence and photosynthetic pigment.]

**Randall, R. and B. Randall.** 1986. The Kapodistrias affair -- another oiling incident affecting seabirds. *Bokmakierie* **38**(2):37-40.

Keywords : South Africa, Africa, rehabilitation, oiled, bird, population, salt water, Oone, species, penguin, coast

[ An account of the grounding of the Kapodistrias on the coast of South Africa; emphasis on the rehabilitation efforts for oiled birds plus general comments on other aspects.]

**Randall, R. M., B. M. Randall, and J. Bevan.** 1980. Oil pollution and penguins -- is cleaning justified? *Marine Pollut. Bull.* **11**(8):234-237.

Keywords : penguin, cleaning, oiled, South Africa, Africa, rehabilitation, justification, salt water, Oone, bird, coast

[ Assessment of the justification for rehabilitating oiled penguins from the coast of South Africa.]

**Randolph, R. C., J. T. Hardy, S. W. Fowler, A. R. G. Price, and W. H. Pearson.** 1998. Toxicity and persistence of nearshore sediment contamination following the 1991 Gulf War. *Environ. Internat.* **24**(1/2):33-42.

Keywords : toxicity, persistence, sediment, beach, Kuwait, Saudi Arabia, Gulf oil spill, amphipod, petroleum hydrocarbons, salt water, Ofour, marine invertebrate, spill, static, petroleum, hydrocarbons

[ Toxicity assessment of sediment samples collected at 11 beach sites at four tidal elevations in Kuwait and Saudi Arabia 30 mo after the 1991 Gulf oil spill. Conducted 10-day static toxicity tests with a marine amphipod. Also measured petroleum hydrocarbons in sediment.]

**Rattner, B. A.** 1981. Tolerance of adult mallards to subacute ingestion of crude petroleum oil. *Toxicol. Letters* **8**():337-342.

Keywords : mallard, ingestion, Oone, Prudhoe Bay crude oil, crude oil, diet, weight, physiology, bird, Prudhoe Bay

[ Response of adult mallards to Prudhoe Bay crude oil in their diet for 7 days; weights and physiological measures.]

**Rattner, B. A., J. L. Capizzi, K. A. King, L. J. LeCaptain, and M. J. Melancon.** 1995. Exposure and effects of oilfield brine discharges on western sandpipers (*Calidris mauri*) in Nueces Bay, Texas. *Bull. Environ. Contam. Toxicol.* **54**(5):683-689.

Keywords : oilfield, discharges, Texas, brine water, weight, hydrocarbons, aliphatic, aromatic, bird, sandpiper, Oone, metabolism, water

[ Assessment of the exposure to and effects of oil in brine water discharges by western sandpipers of coastal Texas; weights, physiological measures, and hydrocarbon analysis.]

**Rattner, B. A. and W. C. Eastin, Jr.** 1981. Plasma corticosterone and thyroxine concentrations during chronic ingestion of crude oil in mallard ducks (*Anas platyrhynchos*). *Comp. Biochem. Physiol.* **68C**():103-107.

Keywords : ingestion, crude oil, mallard, duck, duckling, diet, Prudhoe Bay crude oil, physiology, stress, Oone, bird, adrenal, Prudhoe Bay

[ Assessment of thyroid and adrenal function in mallard ducklings fed diets containing varying amounts of Prudhoe Bay crude oil for 18 weeks.]

**Rattner, B. A., E. L. Flickinger, and D. J. Hoffman.** 1993. Morphological, biochemical, and

histopathological indices and contaminant burdens of cotton rats (*Sigmodon hispidus*) at three hazardous waste sites near Houston, Texas, USA. Environ. Pollut. **79**(1):85-93.

Keywords : biochemical, pathology, weight, hydrocarbons, metabolism, organochlorines, hazardous waste, Otter, mammal, rat, biochemistry, concentration, petroleum hydrocarbons, petroleum  
[ Assessment of health of cotton rats at three hazardous waste sites near Houston, TX; measures of biochemistry, pathology, body weight, and concentrations of organochlorines and petroleum hydrocarbons.]

**Rayburn, J. R., P. S. Glas, S. S. Foss, and W. S. Fisher.** 1996. Characterization of grass shrimp (*Palaemonetes pugio*) embryo toxicity tests using the water soluble fraction of Number 2 fuel oil. Mar. Pollut. Bull. **32**(12):860-866.

Keywords : grass shrimp, shrimp, embryo, toxicity, No.2 fuel oil, fuel oil, survival, salt water, Ofour, marine invertebrate

[ Experimental modification of an established toxicity test employing grass shrimp. Investigators used the water-soluble fraction (WSF) of No. 2 fuel oil to test a shorter exposure period, reduced sample size, and reduced amounts of toxicant. Used 5, 8, 10, 20, and 40 % WSF for evaluation of embryo survival. Calculated LC<sub>50</sub> values, determined embryo survival, and assessed differences among broods.]

**Reddy, C. M. and J. G. Quinn.** 1999. GC-MS analysis of total petroleum hydrocarbons and polycyclic aromatic hydrocarbons in seawater samples after the *North Cape* oil spill. Mar. Pollut. Bull. **38**(2):126-135.

Keywords : petroleum hydrocarbons, aromatic hydrocarbons, TPH, spill, methods, recovery, detection, fuel oil, No.2 fuel oil, Rhode Island, GC-MS, Online, salt water, technical

[ Description of a GC-MS method for measuring total petroleum hydrocarbons and polycyclic aromatic hydrocarbons during the same run. Accuracy, recoveries, and detection limits are comparable to conventional methods. Used to analyze seawater samples from the *North Cape* oil spill (No. 2 fuel oils) off the coast of Rhode Island.]

**Reddy, M. S., N. L. Lahiry, R. J. Rao, and B. Panda.** 1970. Influence of oil coating of eggs on oil penetration into the shell membranes and albumen during storage at room temperature. Indian Poultry Gazette **53&54**(4&1):1-4.

Keywords : eggs, spray, chicken, egg shell, pores, Oone, bird, storage

[ Assessment of the penetration ability of "oil" applied to chicken eggs in preparation for storage.]

**Redig, P. T., J. White, J. Scott, J. Dunnette, P. Lind, and B. Talbot.** 1990. A medical assessment of bald eagles from Prince William Sound in the wake of the Exxon lube job. Anonymous. Annual Conference of the Association of Avian Veterinarians, pp.171-174.

Keywords : bald eagle, Prince William Sound, Alaska, spill, Prudhoe Bay crude oil, physiology, blood, salt water, Oone, bird

[ Results of the analyses of blood samples collected from bald eagles trapped in Prince William Sound during the summer of 1989.]

**Reed, M., D. French, J. Calambokidia, and J. Cubbage.** 1987. Simulation modeling of the effects of oil spills on population dynamics of northern fur seals. Anonymous. pp.i-xiii, 1-142. MMS 86-0045. Minerals Management Service. Washington, DC.

Keywords : simulation, spill, population, fur, seals, model, estimate, Alaska, fur seal, mammal, salt water, Otwa

[ Use of population models to estimate the effects of two oil spill scenarios on populations of fur seals in Alaska.]

**Reed, M., M. L. Spaulding, E. Lorda, H. Walker, and S. B. Saila.** 1984. Oil spill fishery impact assessment modeling: the fisheries recruitment problem. *Estuarine Coastal Shelf Sci.* **19**(6):591-610.

Keywords : spill, model, fish, Maine, fate, population, eggs, larvae, Georges Bank, Othree, salt water, development, fishery, region, transport

[ Development of a fisheries model for assessment of the effect of oil spills on fish recruitment in the Georges Bank - Gulf of Maine region. The model consists of an oil spill fates model, a continental shelf hydrodynamics model, an ichthyoplankton transport and fates model, and a fish population model.]

**Reid, P. C.** 1987. The importance of the planktonic ecosystem of the North Sea in the context of oil and gas development. *Phil. Trans. R. Soc. Lond. B* **316**(1181):587-602.

Keywords : ecosystem, North Sea, development, phytoplankton, zooplankton, fish, population, structure, biomass, plankton, time, hydrocarbons, petroleum hydrocarbons, salt water, Ofour, marine invertebrate, marine plant

[ An assesement of the energy budget of a portion of the North Sea ecosystem. Calculations were made for annual production of phytoplankton, zooplankton, fish, benthos, detritus, and oil and gas. Data on North Sea phytoplankton and zooplankton were collected between 1948 and 1982.

Temporal changes in population structure and biomass of plankton are compared with hydrocarbon production during this 35-year period.]

**Reimer, A. A.** 1975. Effects of crude oil on the feeding behavior of the zoanthid *Palythoa variabilis*. *Environ. Physiol. Biochem.* **5**():258-266.

Keywords : effects, feeding, behavior, coral, diesel fuel, Bunker C, fuel oil, static, assay, petroleum products, ingestion, concentration, filter paper, salt water, Ofour, marine invertebrate

[ Polyps of a coral species were tested for the effects of exposure to either diesel or Bunker C fuel oil. Exposed polyps in static assays to pieces of filter paper containing amino acids, glutathione, proline analogs, or the petroleum products while in clean water. Measured ingestion response to untreated paper for up to 96 hrs. Then determined ingestion response to untreated paper while polyps were immersed in three different concentrations of diesel in water. A final test on ingestion of untreated paper was performed after 30 min immersion in pure diesel or Bunker C oil.]

**Richardson, M. G., M. Heubeck, D. Lea, and P. Reynolds.** 1982. Oil pollution, seabirds, and operational consequences, around the Northern Isles of Scotland. *Environ. Conserv.* **9**(4):315-321.



Keywords : Scotland, bird, numbers, marine birds, spill, salt water, Oone, oil terminal, oiling  
[ Assessment of the incidence of seabird oiling around the Northern Isles of Scotland during 1978-81. Descriptions of bird losses and actions taken to reduce the increased numbers that were correlated with the opening of the Sollom Voe Terminal.]

**Rigger, D.** 1997. Edible oils: are they really that different? Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.59-61. American Petroleum Institute. Washington,DC.

Keywords : spill, nonpetroleum oil, vegetable oil, regulation, Oten, miscellaneous  
[ Critical assessment of the rational for passage of the Edible Oils Regulatory Reform Act. Presents several case studies of edible oil spills.]

**Riley, R. T., M. C. Mix, R. L. Schaffer, and D. L. Bunting.** 1981. Uptake and accumulation of naphthalene by the oyster *Ostrea edulis*, in a flow-through system. Mar. Biol. **61**():267-276.

Keywords : uptake, accumulation, naphthalene, oyster, flow-through, metabolism, microbes, assay, degradation, concentration, metabolite, static, muscle, gill, salt water, Ofour, marine invertebrate

[ Assessment of the uptake, accumulation, and metabolism of naphthalene by an oyster and microbes in a flow-through experimental assay. Evaluation of microbial degradation performed with or without streptomycin in the water; concentrations of metabolites determined in water. Uptake and metabolism of naphthalene by oysters determined with flow-through and static (<sup>14</sup>C) experiments. Measured concentrations of naphthalene and metabolites in adductor muscle, body, and gills.]

**Rinkevich, B. and Y. Loya.** 1977. Harmful effects of chronic oil pollution on a Red Sea scleractinian coral population. Anonymous. Third International Coral Reef Symposium, pp.585-591. University of Miami. Miami,FL.

Keywords : chronic, Red Sea, coral, colony, population, condition, reproduction, planulae, gonads, numbers, survival, Iranian crude oil, crude oil, annual, Ofour, salt water, marine invertebrate, coral reef

[ A comparison of coral populations at a chronically-polluted site and an unpolluted reference site in the northern Gulf of Eilat. More than 300 colonies were sampled during the course of the 1.5 yr study. Colonies were visited every 3 wks. Determined the percent of colonies in breeding condition, condition of the gonads, number of planulae released, effect of oil on settlement rate of planulae in the field and on settlement rate and survival in the laboratory (water soluble fraction of Iranian crude oil in the lab), and the annual death rate of colonies.]

**Rinkevich, R. and Y. Loya.** 1979. Laboratory experiments on the effects of crude oil on the Red Sea coral *Stylophora pistillata*. Mar. Pollut. Bull. **10**(11):328-330.

Keywords : crude oil, Red Sea, coral, Iranian crude oil, reproduction, colony, flow-through, female, gonads, survival, salt water, Ofour, marine invertebrate

[ Laboratory evaluation of the effects of Iranian crude oil on reproduction of a Red Sea coral. One hundred small and eight large colonies of coral were transferred to four large flow-through tanks. Corals were exposed weekly to crude oil that was added to the water surface and then removed after

24 hr. Exposure continued for 6 mo. Measured the number of female gonads per polyp after 2 mos for the large colonies (upper part of tanks) and after 6 mos for the small colonies (lower part of the tanks). Also determined survival.]

**Rittinghaus, H.** 1956. About the "indirect" propagation of the oil plague in a sea-bird refuge (in German). *Ornithologische Mitteilungen* **8**(3):43-46.

Keywords : North Sea, bird, marine birds, reproduction, oiled, eggs, plumage, salt water, Oone, hatchability, oiling

[ Account of the severe oiling of an island in the North Sea just prior to the arrival of breeding seabirds; observations of the effects of remaining oil on the breeding effort.]

**Roberson, A. and J. Berger.** 1981. The toxicity of the dispersant Corexit 9527 and oil-dispersant mixtures to ciliate protozoa. *Chemosphere* **10**(1):33-39.

Keywords : dispersant, Corexit 9527, growth, rate, population, static, bioassay, concentration, crude oil, emulsion, protozoa, salt water, ODfour, marine invertebrate

[ Assessed the effects of Corexit 9527 on the growth rate of protozoan populations. Performed static bioassays wherein five species of protozoa were exposed to either varying concentrations of Corexit 9527, crude oil emulsion, or crude oil mixed with several concentrations of Corexit 9527. Measured growth rate of each species population.]

**Robertson, M. J.** 1978. Occurrence and effects of chronic, low-level oil contamination in a population of sooty terns (*Sterna fuscata*). Anonymous. pp.i-iv,1-42. Manomet Bird Observatory. Manomet, MA.

Keywords : population, tern, plumage, Florida, oiled, salt water, Oone, bird, oiling

[ Report of the incidence of plumage oiling and an assessment of the consequences thereof for a colony of sooty terns on the Dry Tortugas, FL during the period 1962-77.]

**Robineau, D. and P. Fiquet.** 1994. Cetaceans of Dawhat ad-Dafi and Dawhat al-Musallamiya (Saudi Arabia) one year after the Gulf War oil spill. *Courier Forsch. -Inst. Senckenberg* **166**():76-80.

Keywords : spill, beach, Gulf oil spill, Arabian Gulf, crude oil, mammal, Otwo, population, salt water

[ Beach and aerial assessment of the effects of the Gulf oil spill on cetaceans in a portion of the Arabian Gulf; conducted 1 year after the spill.]

**Rocke, T. E., T. M. Yuill, and R. D. Hinsdill.** 1984. Oil and related toxicant effects on mallard immune defenses. *Environ. Res.* **33**(2):343-352.

Keywords : mallard, crude oil, Bunker C, fuel oil, Corexit 9527, South Louisiana crude oil, immune response, dosed, ODone, dispersant, bird

[ Effects on mallard immune response to dosing with varying amounts of crude oil, Bunker C fuel oil, Corexit 9527, or mixtures of Corexit 9527 and oil for 28 days.]

**Rossi, S. S. and J. W. Anderson.** 1975. Toxicity of water-soluble fractions of No. 2 fuel oil and South Louisiana crude oil to selected stages in the life history of the polychaete, *Neanthes*

*arenaceodentata*. Bull. Environ. Contam. Tox. **16**(1):18-24.

Keywords : fuel oil, South Louisiana crude oil, crude oil, No.2 fuel oil, polychaete, static, bioassay, juvenile, adult, concentration, marine invertebrate, survival, salt water, Ofour

[ Evaluation of the toxicity of water-soluble fractions (WSF) of No. 2 fuel oil and South Louisiana crude oil to life stages of a marine polychaete. Used static bioassays to expose 4, 18, 32, or 40 segment juveniles and 48 or 60 segment adults to five concentrations of WSF for 96 hr. Measured death and calculated  $TL_m$  values for 24, 48, and 96 hr. Compared results with those of other marine invertebrates.]

**Rossi, S. S. and J. W. Anderson.** 1977. Accumulation and release of fuel-oil-derived diaromatic hydrocarbons by the polychaete *Neanthes arenaceodentata*. Mar. Biol. **39**(1):51-55.

Keywords : accumulation, aromatic hydrocarbons, polychaete, male, female, static, bioassay, concentration, No.2 fuel oil, fuel oil, depuration, eggs, naphthalene, larvae, juvenile, salt water, Ofour, marine invertebrate, sex

[ Assessment of the accumulation and loss of naphthalenes by a marine polychaete. Male and gravid female polychaetes were exposed in a static bioassay to a 25% concentration of No. 2 fuel oil water-soluble-fraction for 1 hr. This was followed by a depuration period, during which the females released their eggs. Measured the concentrations of naphthalenes in both sexes and in the released eggs, trochophore larvae, and juveniles.]

**Rossi, S. S. and J. W. Anderson.** 1977. Effect of No. 2 fuel oil and South Louisiana crude oil water-soluble fractions on hemoglobin compensation and hypoxia tolerance in the polychaetous annelid, *Neanthes arenaceodentata* (Moore). Mar. Sci. Commun. **3**(2):117-131.

Keywords : No.2 fuel oil, fuel oil, crude oil, polychaete, static, bioassay, concentration, oxygen, hemoglobin, survival, tissue, South Louisiana crude oil, salt water, Ofour, marine invertebrate, Louisiana, Louisiana crude oil, water, dissolved

[ A marine polychaete was exposed in a static bioassay to several concentrations of the water-soluble fraction of either No. 2 fuel oil or South Louisiana crude oil for 11 da. Some of the test groups were subjected to water containing reduced oxygen. Measured survival, dissolved oxygen, and hemoglobin concentration of tissue.]

**Rossi, S. S. and J. W. Anderson.** 1978. Petroleum hydrocarbon resistance in the marine worm *Neanthes arenaceodentata* (Polychaeta: Annelida), induced by chronic exposure to No. 2 fuel oil. Bull. Environ. Contam. Toxicol. **20**(4):513-521.

Keywords : petroleum hydrocarbons, chronic, No.2 fuel oil, fuel oil, polychaete, sublethal, resistance, concentration, bioassay, adult, juvenile, larvae, South Louisiana crude oil, crude oil, depuration, survival, metabolism, salt water, Ofour, marine invertebrate

[ Evaluation of petroleum hydrocarbon resistance in a marine polychaete. Exposed male and female polychaetes to three sublethal concentrations of the water-soluble fraction of No. 2 fuel oil for three generations (9 mos). Then performed 96 hr bioassays on adults, juveniles, and larvae of each generation; used South Louisiana crude oil and No. 2 fuel oil as challenge oils. Bioassays were performed after continuous chronic exposure, after a 7-da depuration period, or after a 14-day depuration period. Measured survival ( $TL_m$ ) and rate of metabolic conversion of  $^{14}C$ -naphthalene.]

**Rossi, S. S. and J. W. Anderson.** 1978. Effects of No. 2 fuel oil water-soluble-fractions on growth and reproduction in *Neanthes arenaceodentata* (Polychaeta: Annelida). Water Air Soil Pollut. **9**(1):155-170.

Keywords : No.2 fuel oil, fuel oil, growth, reproduction, polychaete, larvae, juvenile, adult, sublethal, concentration, static, bioassay, lethal, depuration, hatching, naphthalene, tissue, salt water, Ofour, marine invertebrate

[ Assessment of the effects of water-soluble fractions (WSF) of No. 2 fuel oil on growth and reproduction of a marine polychaete. Exposed hatched larvae, juveniles, and adults to several sublethal concentrations of WSF in static bioassays. Exposed unhatched larvae to lethal and sublethal concentrations of WSF. Unhatched larvae exposed on day 4 or day 7. Hatched larvae exposed for 13 da followed by 11 da of depuration. Juveniles exposed for 28 da. Adults exposed for three generations. Measured larval hatching success and growth, juvenile growth, reproductive success of adults, total dissolved hydrocarbons and naphthalenes in water, and naphthalenes in polychaete tissue.]

**Rossi, S. S., J. W. Anderson, and G. S. Ward.** 1976. Toxicity of water-soluble fractions of four test oils for the polychaetous annelids, *Neanthes arenaceodentata* and *Capitella capitata*. Environ. Pollut. **10**(1):9-18.

Keywords : toxicity, South Louisiana crude oil, Louisiana, crude oil, Kuwait, Kuwait crude oil, fuel oil, Bunker C, polychaete, static, bioassay, concentration, naphthalene, tissue, salt water, Ofour, marine invertebrate

[ Assessment of the toxicity of the water-soluble fractions (WSF) of South Louisiana crude oil, Kuwait crude oil, No. 2 fuel oil, and bunker C fuel oil to two species of marine polychaetes. Used a static bioassay to expose individual worms to five concentrations of the WSF for 96 hr. Calculated the TL<sub>m</sub> values at 24, 48, and 96 hr, concentrations of naphthalenes in test water over time, and concentrations of naphthalenes, total aromatics, and total paraffins in polychaete tissue.]

**Rossi, S. S. and J. M. Neff.** 1978. Toxicity of polynuclear aromatic hydrocarbons to the polychaete *Neanthes arenaceodentata*. Mar. Pollut. Bull. **9**(8):220-223.

Keywords : aromatic hydrocarbons, polychaete, adult, static, assay, survival, concentration, solubility, salt water, Ofour, marine invertebrate

[ Assessment of the toxicity of 10 polynuclear aromatic hydrocarbons to young adults of a species of marine polychaetes. Static laboratory assays were used to expose polychaetes to one of 10 aromatic hydrocarbons for 96 hrs. Measured survival, calculated TL<sub>m</sub>, solubilities of the hydrocarbons, and concentrations of test hydrocarbons in the exposure water.]

**Rossi, S. S., G. W. Rommel, and A. A. Benson.** 1979. Comparison of hydrocarbons in benthic fish from Coal Oil Point and Tanner Bank, California. Anonymous. 1979 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.573-577. American Petroleum Institute, API Publ. 4308. Washington,DC.

Keywords : hydrocarbons, fish, California, species, alkane, unresolved complex mixture, benthic, salt water, Othree, concentration, aromatic, aromatic hydrocarbons, coast

[ Comparison of hydrocarbons in three species of benthic marine fish from Coal Oil Point and Tanner Bank off the coast of southern California; no aromatic hydrocarbons detected, only alkanes and

unresolved complex mixtures.]

**Roubal, W. T., T. K. Collier, and D. C. Malins.** 1977. Accumulation and metabolism of carbon-14 labeled benzene, naphthalene, and anthracene by young coho salmon (*Oncorhynchus kisutch*). Arch. Environ. Contam. Toxicol. **5**(5):513-529.

Keywords : accumulation, metabolism, benzene, naphthalene, salmon, fate, food, tissue, anthracene, concentration, carbon-14, fresh water, Othree, aromatic hydrocarbons, fish

[ Fate of carbon-14 labeled benzene, naphthalene, and anthracene in the food of young coho salmon or injected by intraperitoneal injection; tissue accumulation, metabolism.]

**Roubal, W. T., S. I. Stranahan, and D. C. Malins.** 1978. The accumulation of low molecular weight aromatic hydrocarbons of crude oil by coho salmon (*Oncorhynchus kisutch*) and starry flounder (*Platichthys stellatus*). Arch. Environ. Contam. Toxicol. **7**(2):237-244.

Keywords : Prudhoe Bay crude oil, Othree, aromatic hydrocarbons, hydrocarbons, crude oil, salmon, flounder, accumulation, benzene, naphthalene, muscle, fish, salt water, smolt, water, Prudhoe Bay

[ Accumulation of benzenes and naphthalenes in muscle of smolt coho salmon and starry flounder; exposed to water soluble fraction of Prudhoe Bay Crude for 2 weeks (salmon) and 6 weeks (flounder).]

**Rutherford, P. M., D. K. Banerjee, S. M. Luther, M. R. Gray, M. J. Dudas, W. B. McGill, M. A. Pickard, and M. J. Salloum.** 1998. Slurry-phase bioremediation of creosote and petroleum-contaminated soils. Environ. Technol. **19**(6):683-696.

Keywords : bioremediation, soil, biodegradation, petroleum hydrocarbons, effects, degradation, conductivity, concentration, alkane, PAH, creosote, Oten, miscellaneous

[ Assessment of a biodegradation process used on four soil types contaminated with either creosote or petroleum hydrocarbons. Soils were inoculated with a microbial culture and supplemented with N, P, and S additions. The effect of degradation was followed for 10 wks. Measured pH, electrical conductivity, the negative effect of HgCl addition, and concentrations of PAHs specific to creosote, total extractable organics, and individual alkanes.]

**Sabourin, T. D. and R. E. Tullis.** 1981. Effect of three aromatic hydrocarbons on respiration and heart rates of the mussel, *Mytilus californianus*. Bull. Environ. Contam. Toxicol. **26**(6):729-736.

Keywords : aromatic hydrocarbons, respiration, heart rate, mussel, benzene, toluene, benzo[a]pyrene, static, bioassay, oxygen, concentration, salt water, Ofour, marine invertebrate

[ Marine mussels exposed to the water-soluble fractions of either benzene, toluene, or benzo(a)pyrene in a static bioassay for 24 hours. Measured heart rate, rate of oxygen consumption, and concentration of test hydrocarbons in the exposure water.]

**Saeed, T., H. Al-hashash, and K. Al-Matrouk.** 1998. Assessment of the changes in the chemical composition of the crude oil spilled in the Kuwait desert after weathering for five years. Environ. Internat. **24**(1/2):141-152.

Keywords : composition, crude oil, Kuwait, aromatic hydrocarbons, saturated hydrocarbons, asphaltine, resin, weathered, Oten, miscellaneous, aromatic

[ Assessment of the changes in chemical composition of crude oil spilled in the Kuwait desert after 5 yr of weathering. Measured asphaltine, saturate, aromatic, and resin fractions, and specific PAHs of three or more aromatic rings.]

**Salanitro, J. P., P. B. Dorn, M. H. Huesemann, K. O. Moore, I. A. Rhodes, L. M. R. Jackson, T. E. Vipond, M. M. Western, and H. L. Wisniewski.** 1997. Crude oil hydrocarbon bioremediation and soil ecotoxicity assessment. *Environ. Sci. Technol.* **31**(6):1769-1776.

Keywords : crude oil, bioremediation, soil, organic carbon, concentration, degradation, toxicity, survival, earthworm, bioassay, germination, plant, growth, corn, petroleum hydrocarbons, freshwater invertebrate, freshwater plant, Oten, freshwater, miscellaneous

[ Two soils (low and high organic carbon) were mixed with light, medium, or heavy crude oils (initial concentrations of 4,000-27,000 mg/kg total petroleum hydrocarbons) and monitored for degradation and toxicity. Earthworm bioassays employed five concentrations of soil and were performed throughout the experiment. A Microtox assay was performed throughout the experiment. Seed germination and plant growth assays (21 da) were performed with corn, wheat, and oats on control and 8- or 10-mo bioremediated soil. Measured total petroleum hydrocarbons, oil and grease, BTEX, saturate hydrocarbons, soil leaching potential, earthworm survival, Microtox survival, seed germination, and plant growth.]

**Samain, J. F., J. Moal, A. Coum, J. R. Le Coz, and J. Y. Daniel.** 1980. Effects of the "Amoco Cadiz" oil spill on zooplankton. A new possibility of ecophysiological survey. *Helgolander Meeresunters.* **33**():225-235.

Keywords : Amoco Cadiz, spill, zooplankton, population, France, enzyme, ratio, seasonal, diet, community, composition, salt water, Ofour, marine invertebrate

[ Report of an indirect assessment method to characterize zooplankton populations. Zooplankton were sampled at various sites off the coast of northern France, including the vicinity of the Amoco Cadiz spill over a period of 1 yr. Samples (total zooplankton or several individual species) analyzed for the digestive enzymes amylase and trypsin. Ratios of the enzymes used to show seasonal changes in diet or community composition, and contrast polluted areas with unpolluted areas.]

**Samuels, W. B. and A. Ladino.** 1984. Calculations of seabird population recovery from potential oilspills in the mid-Atlantic region of the United States. *Ecological Modelling* **21**():63-84.

Keywords : population, recovery, region, herring gull, gull, tern, hazard, oilfield, development, salt water, Oone, model, bird, herring

[ Modelling study of the population recovery potential of herring gulls and common terns and a hazard analysis of offshore oilfield development operations in the mid-Atlantic Outer Continental Shelf.]

**Samuels, W. B. and K. J. Lanfear.** 1982. Simulations of seabird damage and recovery from oilspills in the Northern Gulf of Alaska. *J. Environ. Manage.* **15**():169-182.

Keywords : recovery, Alaska, hazard, glaucous-winged gull, gull, common murre, oilfield, development, population, model, salt water, Oone, bird

[ A modelling exercise to determine potential hazard to glaucous-winged gulls and common murrelets of the Northern Gulf of Alaska of offshore oilfield development; population recovery and hazard estimation components.]

**Santas, R., A. Korda, A. Tenente, K. Buchholz, and P. H. Santas.** 1999. Mesocosm assays of oil spill bioremediation with oleophilic fertilizers: Inipol, F1 or both? *Mar. Pollut. Bull.* **38**(1):44-48.

Keywords : spill, bioremediation, fertilizer, biodegradation, Iranian crude oil, crude oil, fish meal, alkane, Oten, salt water, miscellaneous

[ Assessment of the biodegradation of Iranian crude oil in three mesocosms. Added biodegradation enhancement products Inipol EAP-22 (oleophilic) or F1 (fish meal) to two mesocosms; measured alkane biodegradation at the water surface and below the surface.]

**Sarojini, R., A. K. Khan, and R. Nagabhushanam.** 1989. Effect of petroleum hydrocarbons (petrol and diesel) on the physiology of the crab, *Barytelphusa cunicularis*. I - Oxygen consumption. *J. Environ. Biol.* **10**(4):363-365.

Keywords : petroleum hydrocarbons, diesel, physiology, crab, oxygen, freshwater, concentration, diesel fuel, gasoline, static, bioassay, fresh water, Ofive, freshwater invertebrate

[ Exposure of a freshwater crab to four concentrations of either diesel fuel or gasoline for 24, 48, 72, or 96 hrs in a static bioassay. Measured oxygen consumption.]

**Sauer, T. C., J. Michel, M. O. Hayes, and D. V. Aurand.** 1998. Hydrocarbon characterization and weathering of oiled intertidal sediments along the Saudi Arabian coast two years after the Gulf War oil spill. *Environ. Internat.* **24**(1/2):43-60.

Keywords : hydrocarbons, oiled, intertidal, sediment, coast, spill, crude oil, shoreline, weathered, aromatic hydrocarbons, aliphatic, salt water, Oten, miscellaneous

[ Assessment of the weathering of crude oil along the Saudi Arabian coast two yr after the Gulf War oil spill of 1991. Collected surface and subsurface samples from shoreline sediments and performed detailed analyses of the hydrocarbon content. Compared results with geomorphic characteristics of collection sites.]

**Savabieasfahani, M., R. L. Lochmiller, and D. M. Janz.** 1999. Elevated ovarian and thymic cell apoptosis in wild cotton rats inhabiting petrochemical-contaminated terrestrial ecosystems. *J. Toxicol. Environ. Health A* **57**(8):521-527.

Keywords : cotton rat, rat, ovary, thymus, female, tissue, follicle, apoptosis, DNA, Otwo, mammal

[ Determination of the amount of apoptotic cell death in the ovary and thymus of wild female cotton rats occupying a former petrochemical complex. Cotton rats were collected from five petrochemical sites and five matching reference sites. Measured DNA integrity of ovarian and thymic tissue, counted uterine scars, and performed a histological evaluation of follicles.]

**Schreiner, C., Q. Bui, R. Breglia, D. Burnett, F. Koschier, P. Podhasky, L. Lapadula, and R. White.** 1997. Toxicity evaluation of petroleum blending streams: reproductive and developmental

effects of hydrodesulfurized kerosine. *J. Toxicol. Environ. Health* **52**(3):211-229.

Keywords : rat, concentration, male, female, survival, weight, food, organ, development, pathology, reproduction, kerosene, skin, Otto, mammal, fresh water

[ Laboratory rats exposed to five concentrations of hydrodesulfurized kerosine applied daily to the shaved backs of males (8 wk) and females (7 wk); survival, weights, food consumption, birth, and lactation. Males killed at 8 wk, females and young killed at 4 da post-partum; body weight, organ weights, offspring development, macro- and microscopic pathology.]

**Schroder, J. L., N. T. Basta, D. P. Rafferty, R. L. Lochmiller, S. Kim, C. W. Qualls, and K. McBee.** 1999. Soil and vegetation fluoride exposure pathways to cotton rats on a petrochemical-contaminated landfarm. *Environ. Toxicol. Chem.* **18**(9):2028-2033.

Keywords : soil, cotton rat, risk, accumulation, mammal, petroleum, refinery, Oklahoma, vegetation, fluoride, dental fluorosis, Otto, freshwater plant

[ An evaluation of the risk of fluoride accumulation in small mammals inhabiting landfarms used to degrade wastes from petroleum refining. Measured the fluorine content of soil, vegetation, and bone of cotton rats from the vicinity of an old refinery in Oklahoma and from a reference site. Also estimated the severity of dental fluorosis.]

**Schultz, D. and L. B. Tebo, Jr.** 1975. Boone Creek oil spill. Anonymous. 1975 Conference on Prevention and Control of Oil Pollution, pp.583-587. American Petroleum Institute. Washington, DC.

Keywords : spill, diesel fuel, South Carolina, fish, benthic, invertebrate, sediment, algae, periphyton, freshwater invertebrate, freshwater plant, fresh water, Otto, creek, time

[ Results of a spill of diesel fuel into a creek in South Carolina; effects on fish, periphyton, and benthic invertebrates, and residence time in sediments.]

**Schultz, D. P., W. W. Johnson, and A. B. Berkner.** 1983. A unique oiled bird rehabilitation operation -- Myrtle Beach, South Carolina, February 1981. Anonymous. 1983 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), API Publ. 4356, pp.525-528. American Petroleum Institute. Washington, DC.

Keywords : oiled, bird, rehabilitation, species, loon, spill, origin, South Carolina, salt water, Otto, behavior, coast

[ Account of an oiled bird rehabilitation effort for several species of loons on the coast of South Carolina after a spill of unknown origin.]

**Seip, K. L., E. Sandersen, F. Mehlum, and J. Ryssdal.** 1991. Damages to seabirds from oil spills: comparing simulation results and vulnerability indexes. *Ecological Modelling* **53**(1/2):39-59.

Keywords : spill, vulnerability, index, population, species, bird, kittiwake, guillemot, common eider, salt water, Otto, model, simulation, eiders

[ Simulation modelling for estimating harm to seabird populations from oil spills; results are compared to a vulnerability index system. Three species of birds (kittiwake, common guillemot, common eider) are used in the comparisons.]



**Serrazanetti, G. P., L. S. Conte, E. Carpena, C. Bergami, and S. Fonda-Umani.** 1991. Distribution of aliphatic hydrocarbons in plankton of Adriatic Sea open waters. *Chemosphere* **23**(7):925-938.

Keywords : aliphatic, hydrocarbons, plankton, sources, biogenic, petroleum, salt water, Ofour, marine invertebrate, marine plant

[ Plankton of the Adriatic Sea were collected in the spring and late summer. Samples were analyzed for aliphatic hydrocarbons and the results were used to determine the source of the hydrocarbons (biogenic or petroleum).]

**Sharma, V. K., K. Rhudy, R. Brooks, S. Hollyfield, and F. G. Vazquez.** 1997. Petroleum hydrocarbons in sediments of upper Laguna Madre. *Marine Pollut. Bull.* **34**(4):229-234.

Keywords : hydrocarbons, sediment, salt water, Oten, survey, Texas, miscellaneous, petroleum, petroleum hydrocarbons

[ Survey of petroleum hydrocarbons in the sediment of a portion of the upper Laguna Madre.]

**Sharp, B. E.** 1996. Post-release survival of oiled, cleaned seabirds in North America. *Ibis* **138**(2):222-228.

Keywords : survival, oiled, North America, cleaning, bird, rehabilitation, salt water, Oone, commentary

[ Assessment of the post-release survival of rehabilitated oiled seabirds in North America and a commentary on the utility of cleaning oiled birds.]

**Shaw, D. G. and H. R. Bader.** 1996. Environmental science in a legal context: the *Exxon Valdez* experience. *Ambio* **25**(7):430-434.

Keywords : Exxon Valdez, spill, CERCLA, legal, damage assessment, baseline, restoration, mitigation, natural resource, salt water, Oten, miscellaneous

[ Critical assessment of the legal aspects of the Exxon Valdez oil spill. Consequences of the CERCLA requirements for data collection are evaluated in terms of problems produced for both scientists and lawyers; several suggestions for improvement.]

**Shaw, D. G. and J. N. Wiggs.** 1980. Hydrocarbons in the intertidal environment of Kachemak Bay, Alaska. *Mar. Pollut. Bull.* **11**(10):297-300.

Keywords : hydrocarbons, intertidal, Alaska, sediment, coal, limpet, clam, mussel, snail, sea urchin, saturated, unsaturated, terpenoid, salt water, Ofour, marine invertebrate

[ Assessment of the hydrocarbons in the bivalves, sediment, and coal of five locations within Kachemak Bay, Alaska. Sampled three species of limpet, two clams, two mussels, one snail, and one urchin for hydrocarbons. Analyzed samples for saturated, unsaturated, and terpenoid hydrocarbons.]

**Shelton, M. E., P. J. Chapman, S. S. Foss, and W. S. Fisher.** 1999. Degradation of weathered oil by mixed marine bacteria and the toxicity of accumulated water-soluble material to two marine crustacea. *Arch. Environ. Contam. Toxicol.* **36**(1):13-20.

Keywords : degradation, weathered, bacteria, toxicity, North Slope crude oil, crude oil, embryo, grass shrimp, shrimp, larvae, survival, petroleum hydrocarbons, Ofour, salt water, marine invertebrate

[ Artificially-weathered Alaskan North Slope crude oil degraded by four different mixtures of marine bacteria over periods of 7 or 14 da. Compared to the degradation in a sterile control and a nutrient-limited version of one of the marine bacteria mixtures. Embryos of grass shrimp were exposed for 12 da to the water-soluble fractions (WSF) of all experimental groups. Larvae of mysid shrimp were exposed to WSF from the sterile control and one of the bacteria mixtures. Measured survival of embryos and larvae and analyzed the recovered WSF.]

**Short, J. W. and R. A. Heintz.** 1997. Identification of *Exxon Valdez* oil in sediments and tissues from Prince William Sound and the northwestern Gulf of Alaska based on a PAH weathering model. *Environ. Sci. Technol.* **31**(8):2375-2384.

Keywords : Exxon Valdez, sediment, mussel, Prince William Sound, Alaska, model, crude oil, gravel, weathered, concentration, Oten, salt water, miscellaneous

[ Development of a PAH weathering model used to assess weathering of crude oil in a large number of field samples from Prince William Sound, Alaska. Used gravel coated with four quantities of crude oil and then weathered for 6 mos. Field samples consisted of sediment and mussel tissue. Measured concentrations of selected PAH in field samples and experimental gravel.]

**Shriadah, M. A.** 1999. Oil contamination along oil tanker routes off the United Arab Emirates (the Arabian Gulf and the Gulf of Oman). *Bull. Environ. Contam. Toxicol.* **63**(2):203-210.

Keywords : Arabian Gulf, Gulf of Oman, water, aromatic hydrocarbons, concentration, Oten, salt water, miscellaneous

[ Determination of petroleum contamination in portions of the Arabian Gulf and Gulf of Oman. Collected 288 water samples (surface and 10-m depth) between October 1995 and September 1996. Analyzed water for aromatic hydrocarbons.]

**Shriadah, M. M. A.** 1998. Impacts of an oil spill on the marine environment of the United Arab Emirates along the Gulf of Oman. *Mar. Pollut. Bull.* **36**(11):876-879.

Keywords : spill, Iranian crude oil, crude oil, water, sediment, aromatic hydrocarbons, intertidal, concentration, salt water, Oten, miscellaneous, organic carbon, aromatic, hydrocarbons, organic, carbon

[ Assessment of the contamination caused by a spill of Iranian crude oil in the Gulf of Oman, March 1994. Sampled offshore water (surface, subsurface) and intertidal sediment and water. Analyzed water for aromatic hydrocarbons and sediment for aromatic hydrocarbons and organic carbon. Sampling performed twice in April and once in July and November.]

**Simons, E. A. and M. Akin.** 1987. Dead endangered species in a California oil spill. Anonymous. 1987 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), pp.417-418. American Petroleum Institute. Washington, DC.

Keywords : endangered species, species, California, waste water, rat, mammal, Otter, oilfield, bird, fresh water, spill, behavior, brine water, water

[ Report of the death of 11 endangered (state) giant kangaroo rats in California due to an overflow of brine water from an oilfield.]

**Simpson, R. D., S. D. A. Smith, and A. R. Pople.** 1995. The effects of a spillage of diesel fuel on a rocky shore in the sub-Antarctic region (Macquarie Island). *Mar. Pollut. Bull.* **31**(4-12):367-371.

Keywords : diesel, diesel fuel, rocky shore, spill, shoreline, oiled, littoral, sublittoral, invertebrate, community, structure, multivariate, salt water, Ofour, marine invertebrate

[ Assessment of the effects of a spill of marine diesel fuel on the shoreline of a sub-Antarctic island 6 mos after the spill. Two oiled and two unoiled locations were sampled; evaluated biota on rocky substrate in the littoral and sublittoral zones and the invertebrate community structure of the giant kelp. Used univariate and multivariate analyses to compare sites.]

**Singer, M. M., S. George, D. Benner, S. Jacobson, R. S. Tjeerdema, and M. L. Sowby.** 1993. Comparative toxicity of two oil dispersants to the early life stages of two marine species. *Environ. Toxicol. Chem.* **12**(10):1855-1863.

Keywords : toxicity, dispersant, embryo, juvenile, flow-through, bioassay, survival, abnormalities, concentration, salt water, ODfour, marine invertebrate, water

[ Assessment of the toxicity of two oil dispersants (Slik-A-Way, Nokomis 3) to red abalone embryos and juveniles of the forest mysid. Exposure was for 48 or 96 hrs in a flow-through laboratory bioassay using five concentrations of dispersant. Measured survival, developmental abnormalities among abalone embryos, and concentrations of dispersants in exposure water.]

**Singer, M. M., S. George, S. Jacobson, I. Lee, R. S. Tjeerdema, and M. L. Sowby.** 1994.

Comparative effects of oil dispersants to the early life stages of topsmelt (*Atherinops affinis*) and kelp (*Macrocystis pyrifera*). *Environ. Toxicol. Chem.* **13**(4):649-655.

Keywords : dispersant, toxicity, larvae, growth, zoospore, salt water, fish, marine plant, ODthree, concentration

[ Toxicity of several concentrations of two oil dispersants (Nokomis 3, Slik-A-Way) to larvae of topsmelt and zoospores of giant kelp; 96 hr test for topsmelt and 48 hr test for kelp. Measures of death for topsmelt and growth for kelp.]

**Singer, M. M., S. George, S. Jacobson, I. Lee, L. L. Weetman, R. S. Tjeerdema, and M. L. Sowby.** 1995. Acute toxicity of the oil dispersant Corexit 9554 to marine organisms. *Ecotoxicol. Environ. Safety* **32**():81-86.

Keywords : toxicity, dispersant, Corexit 9554, embryo, juvenile, larvae, zoospore, flow-through, bioassay, survival, abnormalities, concentration, salt water, ODfour, marine invertebrate, marine plant, fish, length, water

[ Assessment of the toxicity of the oil dispersant Corexit 9554 to embryos of the red abalone, juvenile kelp forest mysids, larvae of the top smelt, and motile zoospores of the giant kelp. Exposure was in a flow-through bioassay for 48 or 96 hrs using five dispersant concentrations. Measured survival, developmental abnormalities in the abalone embryos, germ tube length of kelp zoospores, and dispersant concentrations in exposure water.]

**Singer, M. M., S. George, S. Jacobson, I. Lee, L. L. Weetman, R. S. Tjeerdema, and M. L.**

**Sowby.** 1996. Comparison of acute aquatic effects of the oil dispersant Corexit 9500 with those of

other Corexit series dispersants. *Ecotoxicol. Environ. Safety* **35**(2):183-189.

Keywords : dispersant, toxicity, embryo, juvenile, flow-through, bioassay, survival, abnormalities, concentration, salt water, ODfour, marine invertebrate, water

[ Assessment of the toxicity of the oil dispersant Corexit 9500 to embryos of the red abalone and juveniles of the kelp forest mysid. Exposure was in a flow-through bioassay for 48 or 96 hrs using five dispersant concentrations. Measured survival, developmental abnormalities of abalone embryos, and concentration of dispersant in the exposure water.]

**Singer, M. M., S. George, I. Lee, S. Jacobson, L. L. Weetman, G. Blondina, and R. S.**

**Tjeerdema.** 1998. Effects of dispersant treatment on the acute aquatic toxicity of petroleum hydrocarbons. *Arch. Environ. Contam. Toxicol.* **34**(2):177-187.

Keywords : dispersant, toxicity, petroleum hydrocarbons, concentration, Prudhoe Bay crude oil, crude oil, abnormalities, Corexit 9527, dispersal, salt water, ODfour, marine invertebrate, fish, acute, narcosis, behavior, Prudhoe Bay

[ Evaluation of the effects of five concentrations of the water-accomodated fraction of Prudhoe Bay crude oil, with and without Corexit 9527 dispersant. Tested with a mysid, red abalone, and the topsmelt. Test duration was either 48 (abalone) or 96 hr. Measured were death and initial narcosis (mysid and topsmelt) or larval abnormality (abalone).]

**Siniff, D. B., T. D. Williams, A. M. Johnson, and D. L. Garshelis.** 1982. Experiments on the response of sea otters *Enhydra lutris* to oil contamination. *Biol. Conserv.* **23**():261-272.

Keywords : mammal, sea otter, cleaning, oiled, salt water, Otwo, Prudhoe Bay crude oil, crude oil, fur, behavior, rehabilitation, experiment, light, oiling, water

[ Two experiments (field and lab) were performed on sea otters to assess the effects of light oiling, light oiling and cleaning, and behavioral response to oiled water. The field study employed radio transmitters and the lab study used an above-ground pool.]

**Siron, R., G. Giusti, B. Berland, R. Morales-Loo, and E. Pelletier.** 1991. Water-soluble petroleum compounds: chemical aspects and effects on the growth of microalgae. *Sci. Total Environ.* **104**(3):211-227.

Keywords : growth, Arabian Light crude oil, crude oil, concentration, static, bioassay, composition, degradation, photosynthesis, salt water, Ofive, marine plant

[ Evaluation of the effects of the water-soluble fraction (WSF) of Arabian Light crude oil on two species of microalgae. Exposure was for up to 14 da using 11 concentrations of WSF in a static laboratory bioassay; WSF-phosphorus interactions were also tested. Measured photosynthetic activity, change in growth of cell cultures, and the composition and degradation over time of the WSF.]

**Slade, G. J.** 1982. Effect of Ixtoc I crude oil and Corexit 9527 dispersant on spot (*Leiostomus xanthurus*) egg mortality. *Bull. Environ. Contam. Toxicol.* **29**(5):525-530.

Keywords : crude oil, Corexit 9527, dispersant, eggs, combination, survival, concentration, Ixtoc I crude oil, fish, spot, salt water, ODthree, water

[ Effects of Ixtoc I crude oil or Corexit 9527 alone or in combination on the survival of eggs of the spot; water soluble fraction of crude oil, seven concentrations plus a control.]

**Smith, R. L. and J. A. Cameron.** 1979. Effect of water soluble fraction of Prudhoe Bay crude oil on embryonic development of Pacific herring. Anonymous. Transactions of the American Fisheries Society, pp.70-75. American Fisheries Society.

Keywords : Prudhoe Bay crude oil, crude oil, development, Pacific herring, herring, eggs, survival, growth, salt water, fish, Othree, society, Pacific, water, Prudhoe Bay

[ Effect on eggs of the Pacific herring of exposure for 4 hr to 6 da to the water soluble fraction of Prudhoe Bay crude oil; survival, growth, development.]

**Smith, S. D. A. and R. D. Simpson.** 1995. Effects of the 'Nella Dan' oil spill on the fauna of *Durvillaea antarctica* holdfasts. Mar. Ecol. Prog. Ser. **121**():73-89.

Keywords : spill, Antarctica, diesel, diesel fuel, oiled, sediment, aromatic hydrocarbons, concentration, multivariate, community, community similarity, population, salt water, Ofour, marine invertebrate

[ Assessment of the effects of a spill of light marine diesel fuel along the shore of Macquarie Island. Samples of the holdfasts of a species of kelp were collected a year after the spill at five sites (two heavily oiled, one moderately oiled, two reference). Measured sediment content of holdfasts, aromatic hydrocarbon concentration of the sediment, and volume of holdfast; identified species and measured the size of the four most common species; and performed univariate and multivariate analyses. Used results in intersite comparisons.]

**Smith, T. G., J. R. Geraci, and D. J. St.Aubin.** 1983. Reaction of bottlenose dolphins, *Tursiops truncatus*, to a controlled oil spill. Can. J. Fish. Aquat. Sci. **40**(9):1522-1525.

Keywords : spill, mammal, mineral oil, dolphin, behavior, Otwo, salt water, oil slick, condition

[ Response of bottlenose dolphins to a simulated oil slick (colored mineral oil) under experimental conditions.]

**Snyder, S. B., J. G. Fox, and O. A. Soave.** 1973. Mortalities in waterfowl following Bunker C fuel exposure: Anonymous. pp.i-vi,1-27,vi-xxi. Stanford Medical Center. Stanford, CA.

Keywords : oiled, Bunker C, bird, spill, fuel oil, saturated, hydrocarbons, tissue, salt water, Oone, pathology, California, saturated hydrocarbons

[ Report of the findings from an examination of birds that died after the San Francisco Bay oil spill of 1971; pathological findings and chemical analysis of Bunker C fuel oil and saturated hydrocarbons in bird tissue.]

**Solbakken, J. E., A. H. Knap, and K. H. Palmork.** 1982. Disposition of (9-<sup>14</sup>C) phenanthrene in a subtropical marine teleost (*Haemulon sciurus*). Bull. Environ. Contam. Toxicol. **28**(3):285-289.

Keywords : uptake, elimination, liver, muscle, gonads, bile, dosed, phenanthrene, aromatic hydrocarbons, fish, salt water, Othree, capsule

[ Uptake and elimination of <sup>14</sup>C labeled phenanthrene by blue-striped grunts; capsule dosing, monitored for 12 days in liver, muscle, gonads, and bile.]

**Solbakken, J. E. and K. H. Palmork.** 1981. Metabolism of phenanthrene in various marine animals.

Comp. Biochem. Physiol. **70C**():21-26.

Keywords : metabolism, phenanthrene, flounder, rainbow trout, lobster, capsule, metabolite, bile, intestine, kidney, gonads, dosed, urine, green gland, salt water, Othree, spiny dogfish, marine invertebrate, fish, Norway

[ Metabolism of phenanthrene in flounder, rainbow trout, spiny dogfish, and Norway lobster; dosing by capsule, metabolites measured in urine, bile, stomach/intestine, intestine, kidney, green gland, or gonads.]

**Soler, M., J. O. Grimalt, and J. Albaiges.** 1989. Vertical distribution of aliphatic and aromatic hydrocarbons in mussels from the Amposta offshore oil production platform (western Mediterranean). *Chemosphere* **18**(9/10):1809-1819.

Keywords : aliphatic, aromatic, aromatic hydrocarbons, mussel, Mediterranean, concentration, Spain, depth, salt water, Ofour, marine invertebrate

[ Determination of the concentrations of hydrocarbons in mussels adhering to the legs of oil production platforms in the Mediterrean off the southern coast of Spain. Mussels were collected at six depths (0 to 48 m) and analyzed for aliphatic and aromatic hydrocarbons. Read this article carefully, it has suffered from translation into English.]

**Sommerville, M., T. Lunel, N. Bailey, D. Oland, C. Miles, P. A. Gunter, and T. Waldhoff.** 1997. Orimulsion. Anonymous. 1997 International Oil Spill Conference. Improving Environmental Protection. Progress, Challenges, Responsibilities, pp.479-484. Edition API #4651. American Petroleum Institute. Washington, DC.

Keywords : Orimulsion, fate, behavior, containment, recovery, detection, Onine, salt water, fresh water, technical, spill, water

[ Description of the fate, behavior, containment, recovery, detection, and tracking of Orimulsion in water.]

**Sophia, A. J. A. and T. Balasubramanian.** 1992. Changes in the physical condition of *Meretrix casta* exposed to water-soluble fractions of refined and crude oil. *Arch. Environ. Contam. Toxicol.* **22**(4):471-474.

Keywords : condition, crude oil, clam, diesel, Kuwait crude oil, concentration, aromatic hydrocarbons, weight, index, salt water, Ofour, marine invertebrate

[ Determination of the effects on a clam of the water-soluble fraction (WSF) of diesel, engine oil, and Kuwait crude oil. Clams were exposed to several concentrations of the WSF in laboratory tanks for 30 da. Measured concentrations of aromatic hydrocarbons in exposure water, wet and dry weight of clams, and calculated a condition index for the clams.]

**Spacie, A., P. F. Landrum, and G. J. Leversee.** 1983. Uptake, depuration, and biotransformation of anthracene and benzo

[a]pyrene in bluegill sunfish. *Ecotox. Environ. Safety* **7**():330-341.

Keywords : uptake, anthracene, elimination, metabolism, tissue, liver, brain, carcass, benzo

[a]pyrene, gall bladder, viscera, fish, fresh water, Othree, gall

[ Uptake, elimination, and metabolism of <sup>14</sup>C labeled anthracene and benzo

[a]pyrene was measured in several tissues of bluegill; gall bladder, liver, viscera, brain, carcass.]

**Spaulding, M. L., S. B. Saila, E. Lorda, H. Walker, E. Anderson, and J. C. Swanson.** 1983. Oil-spill fishery impact assessment model: application to selected Georges Bank fish species. *Estuarine Coastal Shelf Sci.* **16**(5):511-541.

Keywords : model, Georges Bank, fish, Maine, Othree, simulation, spill, season, salt water, herring, cod, species, eggs, larvae, survival, haddock, population, fishery, region, Atlantic

[ Modification of a previously published oil-spill fishery assessment model and application to the Georges Bank - Gulf of Maine region. Simulations performed for spills at two locations for each season of the year; consequences for populations of Atlantic herring, haddock, and Atlantic cod determined.]

**Speich, S. M., D. A. Manuwal, and T. R. Wahl.** 1991. The bird/habitat oil index -- a habitat vulnerability index based on avian utilization. *Wildl. Soc. Bull.* **19**(2):216-221.

Keywords : index, habitat, vulnerability, bird, development, spill, species, population, salt water, Oone

[ Description of a bird oil index developed to correct shortcomings of the oil vulnerability index of King and Sanger (1979). Useful for development planning and oil spill contingency planning.]

**Speich, S. M. and S. P. Thompson.** 1987. Impacts on waterbirds from the 1984 Columbia River and Whidbey Island, Washington, oil spills. *Western Birds* **18**( ):109-116.

Keywords : Washington, spill, bird, Bunker C, fuel oil, oiled, wintering, salt water, Oone

[ Report of bird losses from two spills of Bunker C fuel oil in Puget Sound and the Columbia River, Washington in 1984.]

**Spies, R. B. and P. H. Davis.** 1982. Toxicity of Santa Barbara seep oil to starfish embryos: part 3 -- influence of parental exposure and the effects of other crude oils. *Mar. Environ. Res.* **6**(1):3-11.

Keywords : toxicity, starfish, embryo, crude oil, pre-exposure, petroleum hydrocarbons, concentration, growth, oil seep, salt water, Ofour, marine invertebrate

[ Report of two experiments on the effects on starfish embryos of seep oil from Santa Barbara and three other crude oils. In the first experiment, embryos collected from three locations with differing pre-exposures to petroleum hydrocarbons were exposed for 48 hrs to varying concentrations of the water-soluble fraction (WSF) of seep oil (adaptation experiment). In the second experiment, embryos were exposed for 48 hrs to varying concentrations of the WSF of all four oils (comparative toxicity experiment). Measured growth of exposed embryos.]

**Spies, R. B., J. S. Felton, and L. Dillard.** 1982. Hepatic mixed-function oxidases in California flatfishes are increased in contaminated environments and by oil and PCB ingestion. *Marine Biol.* **70**( ):117-127.

Keywords : mixed-function oxidase, California, PCB, ingestion, species, Santa Barbara crude oil, crude oil, food, liver, fish, Othree, salt water

[ Hepatic mixed-function oxidase induction in two species of California flatfish collected at

contaminated coastal sites or experimentally exposed to Santa Barbara crude oil or PCBs in food.]

**Spies, R. B., J. J. Stegeman, D. E. Hinton, B. Woodin, R. Smolowitz, M. Okihiro, and D. Shea.** 1996. Biomarkers of hydrocarbon exposure and sublethal effects in embiotocid fishes from a natural petroleum seep in the Santa Barbara Channel. *Aquatic Toxicol.* **34**():195-219.

Keywords : biomarker, hydrocarbons, species, aromatic hydrocarbons, bile, liver, gill, heart, biochemistry, kidney, pathology, Othree, salt water, chronic, fish, petroleum, aromatic  
[ Biomarkers for petroleum exposure in two species of surfperch from the Santa Barbara Channel compared to reference area: aromatic hydrocarbons in bile; liver, gill, and heart biochemistry; histological examination of gill, liver, and kidney.]

**Spooner, M. F. and C. J. Corkett.** 1979. Effects of Kuwait oils on feeding rates of copepods. *Mar. Pollut. Bull.* **10**(7):197-202.

Keywords : feeding, rate, copepod, weathered, Kuwait crude oil, crude oil, static, bioassay, concentration, dispersant, survival, recovery, feces, salt water, ODfour, marine invertebrate  
[ Effects of weathered or fresh Kuwait crude oil on the feeding rates of four species of marine copepods. Exposure was by static bioassay for 20 hrs. Oils were prepared as either water soluble fractions (two concentrations) or oil suspensions (1, 2, or 10 ppm) with or without a chemical dispersant. Measured survival, recovery, and number of fecal pellets.]

**Sprague, J. B. and W. J. Logan.** 1979. Separate and joint toxicity to rainbow trout of substances used in drilling fluids for oil exploration. *Environ. Pollut.* **19**(4):269-282.

Keywords : toxicity, rainbow trout, surfactant, survival, drilling fluids, degradation, additivity, ODthree, fresh water, dispersant, fish  
[ Young rainbow trout used to assess the toxicity of 21 materials (including surfactants) likely to be present in oil well drilling fluids; survival, additivity, degradation.]

**Squire, J. L., Jr.** 1992. Effects of the Santa Barbara, Calif., oil spill on the apparent abundance of pelagic fishery resources. *Marine Fish. Rev.* **54**(1):7-14.

Keywords : spill, abundance, fishery, Pacific, Santa Barbara crude oil, crude oil, California, anchovy, bonito, mackerel, fish, Othree, salt water, species, estimate  
[ Assessment of the effect of the 1969 oil well blowout in the Santa Barbara Channel on the Northern anchovy, Pacific bonito, and jack mackerel; abundance estimates for 1966-72.]

**St.Aubin, D. J., J. R. Geraci, T. G. Smith, and T. G. Friesen.** 1985. How do bottlenose dolphins, *Tursiops truncatus*, react to oil films under different light conditions? *Can. J. Fish. Aquat. Sci.* **42**():430-436.

Keywords : dolphin, mammal, mineral oil, motor oil, behavior, salt water, Otwo, light, water  
[ Response of bottlenose dolphins to water covered with either clear mineral oil, dark-colored mineral oil, or a thin sheen of motor oil under experimental conditons. Responses tested in daylight and at night.]

**Stagg, R. M. and A. McIntosh.** 1996. Hydrocarbon concentrations in the northern North Sea and



effects on fish larvae. *Science Total Environ.* **186**(3):189-201.

Keywords : hydrocarbons, concentration, North Sea, fish, larvae, survey, aromatic hydrocarbons, mixed-function oxidase, Othree, salt water, petroleum, water

[ Two North Sea surveys in 1993&94 measured petroleum in the water and associated effects on larvae of the sandeel and gadoid; hydrocarbon fluorescence, mixed-function oxidase induction in larvae.]

**Stainken, D. M.** 1976. A descriptive evaluation of the effects of No. 2 fuel oil on the tissues of the soft shell clam, *Mya arenaria* L. *Bull. Environ. Contam. Toxicol.* **16**(6):730-738.

Keywords : No.2 fuel oil, fuel oil, tissue, clam, concentration, hydrocarbons, pathology, emulsion, Ofour, salt water, marine invertebrate

[ Assessment of the effects on tissues of the soft shell clam of exposure to No. 2 fuel oil. Clams were exposed for 28 da to one of three concentrations of fuel oil emulsions in a static bioassay. Various tissues were sampled for microscopic examination, mucus samples were collected and analyzed for hydrocarbon content, and water in the exposure tanks was analyzed weekly for hydrocarbon concentration.]

**Stainken, D. M.** 1976. The effect of a No. 2 fuel oil and a South Louisiana crude oil on the behavior of the soft shell clam, *Mya arenaria* L. *Bull. Environ. Contam. Toxicol.* **16**(6):724-729.

Keywords : fuel oil, No.2 fuel oil, South Louisiana crude oil, crude oil, behavior, clam, emulsion, benzene, concentration, static, bioassay, temperature, phenol, salt water, Ofour, marine invertebrate

[ Determination of the effect of oil-in-water emulsions of South Louisiana crude oil, No. 2 fuel oil, benzene, and phenol on the behavior of the soft shell clam. Clams were exposed to five concentrations of each substance for 96 hrs in a static bioassay performed at two water temperatures. Measured mucus secretion and tactile response, and attempted to calculate LC<sub>50s</sub>.]

**Stansby, M. E.** 1978. Flavors in fish from petroleum pickup. *Marine Fish. Rev.* **40**(1):13-17.

Keywords : fish, biochemical, petroleum hydrocarbons, flavor, organoleptic, taint, Othree, taste, relation, petroleum

[ Discussion of the relation between fish flavor and its numerous biochemical causes. Particular emphasis on the validity of using fish taste as an indicator of petroleum exposure.]

**Stanton, P. B.** 1975. The hard truth about oil pollution. *Massachussetts Wildl. (Mar.-Apr.)*:16-19.

Keywords : oiled, bird, rehabilitation, population, salt water, Oone

[ Critical assessment of the utility of oiled bird rehabilitation.]

**Staveland, J. T.** 1979. Effects on hatching in *Littorina littorea* after an oil spill. *Mar. Pollut. Bull.* **10**(9):255-258.

Keywords : hatching, spill, Norway, Iranian crude oil, crude oil, reproduction, gastropod, snail, oiled, fertilization, rate, eggs, capsule, salt water, Ofour, marine invertebrate

[ Assessment of the effects of a spill (Norway) of Iranian crude oil on reproduction in a marine

gastropod. Snails were collected from an oiled area and a reference area and transferred to laboratory containers. Measured fertilization rates, number of eggs per capsule, and hatching success.]

**Steadman, B. L., W. A. Stubblefield, T. W. LaPoint, H. L. Bergman, and M. S. Kaiser.** 1991.

Decreased survival of rainbow trout exposed to No. 2 fuel oil caused by sublethal preexposure.

Environ. Toxicol. Chem. **10**(3):355-363.

Keywords : survival, rainbow trout, fuel oil, sublethal, juvenile, concentration, lethal, No.2 fuel oil, Othree, fresh water, previous exposure, fish

[ Effect of preexposure of juvenile rainbow trout to varying sublethal concentrations of No. 2 fuel oil on subsequent exposure to lethal concentrations of No. 2 fuel oil. Sublethal preexposure was for 21 da, lethal exposure was for 14 da.]

**Stegeman, J. J.** 1977. Fate and effects of oil in marine animals. *Oceanus* **20**(4):59-66.

Keywords : fate, petroleum hydrocarbons, hydrocarbons, fish, crustacean, tissue, concentration, metabolism, physiology, bivalve, Othree, salt water, marine invertebrate, biochemical, petroleum

[ Overview of the metabolic fate and effects of petroleum hydrocarbons taken up by fish, crustaceans, and bivalves. Most of the references are to fish; tissue concentrations, metabolism, physiology.]

**Stegeman, J. J.** 1978. Influence of environmental contamination on cytochrome P-450 mixed-function oxygenases in fish: implications for recovery in the Wild Harbor Marsh. *J. Fish. Res. Board Can.* **35**(5):668-674.

Keywords : fish, recovery, benzo

[a]pyrene, fuel oil, spill, barge Florida, No.2 fuel oil, mixed-function oxidase, mummichog, Massachusetts, Othree, salt water, liver, biochemical, protein, Florida

[ Assessment of hepatic cytochrome P-450 mixed-function oxygenases, benzo

[a]pyrene hydroxylase, aminopyrene demethylase, and protein in mummichog from Wild Harbor Marsh.

Goal was to determine if the No. 2 fuel oil spill 8 yr earlier (barge Florida, 1969) was still affecting fish.]

**Stekoll, M. S., L. E. Clement, and D. G. Shaw.** 1980. Sublethal effects of chronic oil exposure on the intertidal clam *Macoma balthica*. *Mar. Biol.* **57**(1):51-60.

Keywords : sublethal, chronic, clam, Prudhoe Bay crude oil, crude oil, bivalve, flow-through, bioassay, depuration, survival, behavior, physical characteristics, gonads, respiration, biochemical, salt water, Ofour, marine invertebrate

[ Assessment of the sublethal effects of Prudhoe Bay crude oil on a marine bivalve. Clams were exposed by flow-through bioassay to either 0.03, 0.3, or 3.0 ppm of dispersed crude oil for 6 mos, followed by 2 mos of depuration. Measured survival, four measures of behavior, five measures of physical characteristics, gonad morphology, respiration rate, and eight biochemical characteristics.]

**Stephenson, R.** 1997. Effects of oil and other surface-active organic pollutants on aquatic birds. *Environ. Conserv.* **24**(2):121-129.

Keywords : organic, bird, water, chronic, risk, feathers, periodic, wetting, Oone

[ Evaluation of the potential for a variety of organic contaminants (natural or anthropogenic) to lower the surface tension of water, thus posing a chronic or periodic risk of feather wetting in birds.]

**Stott, G. G., N. H. McArthur, R. Tarpley, V. Jacobs, and R. F. Sis.** 1981. Histopathologic survey of ovaries of fish from petroleum production and control sites in the Gulf of Mexico. *J. Fish Biol.* **18**(2):261-269.

Keywords : survey, fish, Gulf of Mexico, species, pathology, Othree, salt water, ovary, oilfield, oil field

[ Examination of ovaries from 11 species of fish collected from an active offshore oil field and reference areas; pathology.]

**Stowe, T. J.** 1982. An oil spillage at a guillemot colony. *Marine Pollut. Bull.* **13**(7):237-239.

Keywords : guillemot, crude oil, spill, England, oiled, population, salt water, Oone, bird

[ The effects of a crude oil spill on a colony of guillemots breeding on coastal England.]

**Stowe, T. J. and L. A. Underwood.** 1984. Oil spillages affecting seabirds in the United Kingdom, 1966-1983. *Marine Pollut. Bull.* **15**(4):147-152.

Keywords : spill, Europe, population, United Kingdom, bird, species, history, salt water, Oone

[ Account of seabird losses due to oil spills around the United Kingdom from 1966 to 1983; details of losses, comparison to western Europe, and population consequences.]

**Struhsaker, J. W.** 1977. Effects of benzene (a toxic component of petroleum) on spawning pacific herring, *Clupea harengus pallasii*. *Fishery Bull.* **75**(1):43-49.

Keywords : benzene, Pacific herring, herring, female, concentration, survival, eggs, embryo, larvae, uptake, Othree, fish, salt water, spawning, Pacific

[ Female Pacific herring exposed to two concentrations of benzene for 48 hr just prior to spawning.

Measured survival in ovarian eggs, embryos, and larvae through yolk absorption, and benzene uptake.]

**Sugai, S. F., J. E. Lindstrom, and J. F. Braddock.** 1997. Environmental influences on the microbial degradation of *Exxon Valdez* oil on the shorelines of Prince William Sound, Alaska. *Environ. Sci. Technol.* **31**(5):1564-1572.

Keywords : degradation, Exxon Valdez, Prince William Sound, Alaska, crude oil, spill, hydrocarbons, concentration, mineralization, Oten, microbes, miscellaneous

[ Assessment of the importance of environmental influences on the microbial degradation of crude oil from the Exxon Valdez spill; hydrocarbon concentrations, mineralization potential.]

**Sugiura, K., M. Ishihara, T. Shimauchi, and S. Harayama.** 1997. Physicochemical properties and biodegradability of crude oil. *Environ. Sci. Technol.* **31**(1):45-51.

Keywords : crude oil, biodegradation, microbes, SM8, Oten, miscellaneous

[ Biodegradability of four crude oils by microbes was compared.]

**Symens, P. and M. I. Al Salamah.** 1993. The impact of the Gulf War oil spills on wetlands and waterfowl in the Arabian Gulf. Moser M and van Vessem J (eds.), *Wetland and Waterfowl Conservation in South and West Asia*, IWRB Spec. Publ. No. 25 and AWB Publ. No. 85, pp.24-28. The International Waterfowl and Wetlands Research Bureau & Asian Wetland Bureau. Slimbridge, Gloucester, UK.

Keywords : spill, turtle, Arabian Gulf, bird, mammal, fish, shrimp, marine invertebrate, marine plant, salt water, Oone, waterfowl, conservation, crude oil, reptile

[ Preliminary assessment of environmental destruction caused by the Gulf War oil spill; information on coastal wetlands, birds, mammals, turtles, fish, and shrimp.]

**Symens, P. and M. I. Evans.** 1993. Impact of Gulf War oil spills on Saudi Arabian breeding populations of terns *Sterna* in the Arabian Gulf, 1991. *Sandgrouse* **15**():18-36.

Keywords : spill, population, tern, Arabian Gulf, species, reproduction, oiled, plumage, salt water, Oone, crude oil, bird

[ Effects on tern species in the Arabian Gulf of the Gulf War oil spill; assessment of populations and breeding success in 1991.]

**Symens, P. and A. Suhaibani.** 1993. Impact of Gulf War oil spills on wintering seabird populations along the northern Arabian Gulf coast of Saudi Arabia, 1991. *Sandgrouse* **15**():37-43.

Keywords : spill, wintering, population, numbers, Arabian Gulf, rehabilitation, oiled, bird, plumage, estimate, crude oil, salt water, Oone

[ Account and evaluation of the numbers of wintering seabirds killed by the Gulf War oil spill in the Arabian Gulf during 1991. Also, an account of the rehabilitation efforts for oiled birds.]

**Symens, P. and A. Suhaibani.** 1994. The impact of the 1991 Gulf War oil spill on bird populations in the northern Arabian Gulf -- a review. *Courier Forsch. -Inst. Senckenberg* **166**():47-54.

Keywords : spill, Arabian Gulf, Gulf oil spill, salt water, wintering, bird, habitat, Oone, review

[ Review of the affects on seabirds of the 1991 Gulf oil spill.]

**Szaro, R. C.** 1977. Effects of petroleum on birds. Anonymous. Transactions of the 42nd North American Wildlife and Natural Resources Conference, pp.374-381. Wildlife Management Institute. Washington,DC.

Keywords : bird, spill, physiology, reproduction, vulnerability, species, Oone

[ General presentation on the effects of oil pollution on aquatic birds.]

**Szaro, R. C.** 1979. Bunker C fuel oil reduces mallard egg hatchability. *Bull. Environ. Contam. Toxicol.* **22**():731-732.

Keywords : Bunker C, fuel oil, mallard, eggs, hatchability, embryo, Oone, bird, eggshell, incubation, hatching

[ Assessment of the effect of Bunker C fuel oil on artificially-incubated mallard eggs. Eggshell applications of 5-50  $\mu$ l of Bunker C fuel oil were made on day 8 of incubation; measured hatching success.]

**Szaro, R. C. and P. H. Albers.** 1977. Effects of external applications of No. 2 fuel oil on common eider eggs. Wolfe DA (ed.), pp.164-167. Pergamon Press, Inc. New York, NY.

Keywords : No.2 fuel oil, fuel oil, common eider, eggs, bird, hatchability, salt water, Oone, embryo, eiders, eggshell, hatching, weight, duckling

[ Effect on embryos of common eiders of eggshell applications of varying amounts of No. 2 fuel oil.

Artificially-incubated eggs of the common eider were exposed by eggshell application to either 5  $\mu$ l No. 2 fuel oil, 20  $\mu$ l No. 2 fuel oil, or propylene glycol. Measured hatching success and weight of ducklings.]

**Szaro, R. C., P. H. Albers, and N. C. Coon.** 1978. Petroleum: effects on mallard egg hatchability. *J. Wildl. Manage.* **42**(2):404-406.

Keywords : mallard, eggs, hatchability, embryo, fuel oil, South Louisiana crude oil, crude oil, Kuwait crude oil, paraffin, No.2 fuel oil, Oone, bird, fresh water, eggshell, effects, Louisiana crude oil, survival, hatching, weight

[ Effect on mallard embryos of eggshell applications of varying amounts of No. 2 fuel oil, South Louisiana crude oil, Kuwait crude oil, and a paraffin mixture. Measured survival and hatching weight.]

**Szaro, R. C., N. C. Coon, and W. Stout.** 1980. Weathered petroleum : effects on mallard egg hatchability. *J. Wildl. Manage.* **44**(3):709-713.

Keywords : weathered, mallard, eggs, hatchability, embryo, fuel oil, No.2 fuel oil, Prudhoe Bay crude oil, Oone, bird, eggshell, Prudhoe Bay, crude oil, incubation, hatching, fresh water

[ Comparison of the effects of fresh and weathered No. 2 fuel oil and Prudhoe Bay crude oil on mallard embryos. Artificially-incubated eggs exposed by eggshell application to 1-50  $\mu$ l of fresh or weathered oil on day 8 of incubation. Measured hatching success.]

**Szaro, R. C., M. P. Dieter, G. H. Heinz, and J. F. Ferrell.** 1978. Effects of chronic ingestion of South Louisiana crude oil on mallard ducklings. *Environ. Res.* **17**():426-436.

Keywords : ingestion, South Louisiana crude oil, crude oil, mallard, duckling, diet, growth, physiology, pathology, behavior, Oone, bird, survival, blood, tissue, organ

[ Effects on mallard ducklings of varying amounts of South Louisiana crude oil in the diet (0.025-5%) for 8 weeks. Measured survival, growth, blood chemistry, tissue and organ pathology, and behavior of 7-da old ducklings.]

**Szaro, R. C., G. Hensler, and G. H. Heinz.** 1981. Effects of chronic ingestion of No. 2 fuel oil on mallard ducklings. *J. Toxicol. Environ. Health* **7**():789-799.

Keywords : ingestion, fuel oil, mallard, duckling, diet, growth, physiology, pathology, behavior, No.2 fuel oil, Oone, bird, blood, tissue, organ

[ Effects on mallard ducklings of 0.5 or 5% of No. 2 fuel oil in the diet for 18 weeks. Measured growth, blood chemistry, tissue and organ pathology, and behavior of 9-da-old ducklings.]

**Tahir, A., T. C. Fletcher, D. F. Houlihan, and C. J. Secombes.** 1993. Effect of short-term exposure to oil-contaminated sediments on the immune response of dab, *Limanda limanda* (L.). *Aquatic Toxicol.* **27**():71-82.

Keywords : sediment, immune response, concentration, drilling mud, physiology, biochemistry, pathology, kidney, Othree, salt water, fish, dab, diesel fuel

[ Exposure of dab for 4 weeks to sediment containing four different concentrations of diesel-oil based drilling mud; immune response, physiology, biochemistry, pathology, kidney.]

**Tahir, A. and C. J. Secombes.** 1995. The effects of diesel oil-based drilling mud extracts on immune responses of rainbow trout. Arch. Environ. Contam. Toxicol. **29**(1):27-32.

Keywords : drilling mud, immune response, rainbow trout, dosed, fish, physiology, kidney, diesel fuel, injection, Othree, fresh water, oil-based, experiment

[ Exposure of rainbow trout to an extract derived from diesel oil-based drilling mud. Trout injected with three different doses and maintained for 6 wks in one experiment and one dose in fish maintained for 8 wks (monitored every 2 wks) in another; immune response, physiology, kidney.]

**Tarshis, I. B. and B. A. Rattner.** 1982. Accumulation of  $^{14}\text{C}$ -Naphthalene in the tissues of redhead ducks fed oil-contaminated crayfish. Arch. Environ. Contam. Toxicol. **11**():155-159.

Keywords : accumulation, tissue, duck, transfer, labelled, fuel oil, No.2 fuel oil, crayfish, naphthalene, Oone, bird, water, redhead

[ Experimental documentation of the transfer of  $^{14}\text{C}$ -labelled naphthalene in No. 2 fuel oil to tissues of redhead ducks; ducks were fed crayfish which were previously exposed to the water soluble fraction of the fuel oil.]

**Thomas, P. and L. Budiantara.** 1995. Reproductive life history stages sensitive to oil and naphthalene in Atlantic croaker. Mar. Environ. Res. **39**(1-4):147-150.

Keywords : naphthalene, Atlantic croaker, female, diesel fuel, concentration, biochemistry, pathology, Othree, fish, salt water, Atlantic

[ Female Atlantic croaker were exposed to either water-soluble fractions of diesel fuel or dissolved naphthalene at two concentrations for 5 or 8 wks. Measured sexual maturation and performance; biochemistry, histopathology.]

**Thomas, P., B. R. Woodin, and J. M. Neff.** 1980. Biochemical responses of the striped mullet *Mugil cephalus* to oil exposure I. Acute responses -- interrenal activations and secondary stress responses. Marine Biol. **59**():141-149.

Keywords : biochemical, striped mullet, mullet, fish, stress, Othree, concentration, fuel oil, No.2 fuel oil, accumulation, biochemistry, salt water, juvenile

[ Biochemical response of juvenile striped mullet exposed for 14 da to four concentrations of the water-soluble fraction of No. 2 fuel oil; accumulation, biochemistry.]

**Thomas, R. E. and S. D. Rice.** 1986. The effects of salinity on uptake and metabolism of toluene and naphthalene by Dolly Varden, *Salvelinus malma*. Marine Environ. Res. **18**():203-214.

Keywords : salinity, metabolism, toluene, naphthalene, accumulation, dosed, capsule, fresh water, liver, muscle, tissue, metabolite, salt water, fish, Dolly Varden, Othree, gall, central nervous system

[ Assessment of the effects of salinity on accumulation and metabolism of toluene and naphthalene by young Dolly Varden trout. Trout dosed (capsule) with  $^{14}\text{C}$ -labelled toluene or naphthalene and held for 12, 24, or 48 hrs in freshwater or seawater; liver, central nervous system, and muscle for tissue accumulation and gall, liver, central nervous system, and muscle for metabolite accumulation.]

**Tilseth, S., T. S. Solberg, and K. Westrheim.** 1984. Sublethal effects of the water-soluble fraction of Ekofisk crude oil on the early larval stages of cod (*Gadus morhua* L.). Marine Environ. Res.

**11(1):1-16.**

Keywords : fish, crude oil, Ekofisk crude oil, cod, embryo, larvae, concentration, survival, growth, malformation, swimming, feeding, behavior, salt water, Othree

[ Effects of exposure of cod embryos (1 wk) and larvae (2 wk) to two concentrations of the water-soluble fraction of Ekofisk crude oil; survival, growth, malformations, swimming and feeding behavior.]

**Trivelpiece, W. Z., D. G. Ainley, W. R. Frazer, and S. G. Trivelpiece.** 1990. Skua survival. *Nature* **345**(6272):211-212.

Keywords : survival, South Pole, bird, skuas, behavior, spill, reproduction, salt water, Oone

[ Response to a report of oil spill-induced reproductive failure among South Polar skuas in 1989. Followed by a rebuttal from the authors of the report.]

**Trivelpiece, W. Z., R. G. Butler, D. S. Miller, and D. B. Peakall.** 1984. Reduced survival of chicks of oil-dosed adult Leach's storm-petrels. *The Condor* **86**(1):81-82.

Keywords : survival, Prudhoe Bay crude oil, storm-petrel, nestling, crude oil, growth, organ, weight, salt water, Oone, bird, Prudhoe Bay

[ Effects on adult and nestling Leach's storm petrels of dosing with Prudhoe Bay crude oil; growth and organ weights measured in nestlings.]

**Truett, J. C., M. E. Miller, and K. Kertell.** 1997. Effects of arctic Alaska oil development on brant and snow geese. *Arctic* **50**(2):138-146.

Keywords : Arctic, Alaska, development, population, humans, oilfield, Prudhoe Bay, fresh water, bird, brant, snow goose, Oone, reproduction, distribution, predation, review, activity, structure

[ A review of the effects of oil development activities and structures in the Prudhoe Bay area on local brant and snow goose populations. Authors make use of studies addressing contaminant release, alteration of tundra surface, creation of impoundments, and human activities, and predation.]

**Truscott, B., D. R. Idler, and G. L. Fletcher.** 1992. Alteration of reproductive steroids of male winter flounder (*Pleuronectes americanus*) chronically exposed to low levels of crude oil in sediments. *Can. J. Fish. Aquat. Sci.* **49**(10):2190-2195.

Keywords : steroid, male, winter flounder, flounder, crude oil, sediment, concentration, Venezuelan crude oil, liver, weight, biochemistry, testes, fish, Othree, salt water

[ Male winter flounder were exposed to five concentrations of Venezuelan crude oil in sediment for 4 mos; reproductive steroids, liver weight, body weight, testes weight, biochemistry.]

**Upshall, C., J. F. Payne, and J. Hellou.** 1993. Induction of MFO enzymes and production of bile metabolites in rainbow trout (*Oncorhynchus mykiss*) exposed to waste crankcase oil. *Environ. Toxicol. Chem.* **12**(11):2105-2112.

Keywords : bile, metabolite, rainbow trout, crankcase oil, juvenile, injection, dosed, concentration, mixed-function oxidase, biochemistry, fish, Othree, fresh water

[ Juvenile rainbow trout exposed to waste crankcase oil (injection) for 3 da in a dose-response study (three concentrations) and for 12 da in a time-response study; mixed-function oxidase induction, bile

metabolites, biochemistry.]

**Uysal, Z., C. Saydam, and K. Yilmaz.** 1997. Impact of the recent oil spill (Nassia) in Bosphorus (Turkey) on developmental stages of sea urchin *Paracentrotus lividus* Lam., eggs. *Fresenius Envir. Bull.* **6**():584-588.

Keywords : spill, sea urchin, eggs, concentration, crude oil, assay, temperature, development, salt water, Ofour, marine invertebrate, water

[ Evaluation of the effects on various developmental stages sea urchin of varying concentrations of the water-soluble fraction of crude oil collected from the water surface of the Bosphorus after a recent oil spill. Laboratory assays performed at two water temperatures.]

**Valk, G., E. Hartwig, B. Reineking, E. Schrey, and E. Vauk-Hentzelt.** 1990. Extensive investigations into the effects on seabirds of the oil pollution on the German North Sea coast. Anonymous. *Transactions 19th IUGB Congress*, pp.288-291. Trondheim, Norway.

Keywords : oiled, beach, North Sea, species, bird, salt water, Oone, population, region, history, coast

[ Report of the counts of oiled seabirds found on beaches of the German North Sea coast during 1983-88; species identified and regional differences determined.]

**Van Pelt, T. I. and J. F. Piatt.** 1995. Deposition and persistence of beachcast seabird carcasses. *Marine Pollut. Bull.* **30**(12):794-802.

Keywords : carcass, development, methods, estimate, beach, salt water, Oone, population, bird, rate, persistence

[ Development of a method to analyze deposition rates and persistence of beached seabird carcasses so as to provide for estimates of total losses.]

**Van Veld, P. A., D. J. Westbrook, B. R. Woodin, R. C. Hale, C. L. Smith, R. J. Huggett, and J. J. Stegeman.** 1990. Induced cytochrome P-450 in intestine and liver of spot (*Leiostomus xanthurus*) from a polycyclic aromatic hydrocarbon contaminated environment. *Aquatic Toxicol.* **17**(2):119-132.

Keywords : intestine, liver, spot, aromatic hydrocarbons, hydrocarbons, Chesapeake, sediment, concentration, metabolism, Othree, salt water, fish, activity

[ Spot were collected at four sites in the Elizabeth River, one site at the mouth of the York River, and one site in the lower Chesapeake Bay. Sediments contained PAH concentrations ranging from 9 to 96,000 ppb; cytochrome P-450 and ethoxyresorufin O-deethylase activity in liver and intestine, sediment PAH concentration.]

**Vangilder, L. D. and T. J. Peterle.** 1980. South Louisiana crude oil and DDE in the diet of mallard hens: effects on reproduction and duckling survival. *Bull. Environ. Contam. Toxicol.* **25**():23-28.

Keywords : South Louisiana crude oil, crude oil, DDE, diet, mallard, reproduction, duckling, survival, Oone, bird, Louisiana

[ Effects on mallard reproduction and duckling survival following consumption of diets containing either



South Louisiana crude oil or DDE.]

**Vangilder, L. D. and T. J. Peterle.** 1981. South Louisiana crude oil or DDE in the diet of mallard hens: effects on egg quality. *Bull. Environ. Contam. Toxicol.* **26**():328-336.

Keywords : South Louisiana crude oil, crude oil, DDE, diet, mallard, eggs, reproduction, Oone, bird, Louisiana

[ Effects on mallard egg quality of consumption of diets containing either South Louisiana crude oil or DDE.]

**Vangilder, L. D. and T. J. Peterle.** 1983. Mallard egg quality: enhancement by low levels of petroleum and chlorinated hydrocarbons. *Bull. Environ. Contam. Toxicol.* **30**():17-23.

Keywords : mallard, eggs, DDE, South Louisiana crude oil, crude oil, reproduction, antagonism, Oone, bird, concentration, Louisiana, combination

[ Effects on egg quality of mallards fed low concentrations of South Louisiana crude oil and DDE alone or in combination.]

**Varanasi, U. and D. J. Gmur.** 1981. Hydrocarbons and metabolites in English sole (*Parophrys vetulus*) exposed simultaneously to

[<sup>3</sup>H] benzo

[a]pyrene and

[<sup>14</sup>C] naphthalene in oil-contaminated sediment. *Aquatic Toxicol.* **1**(1):49-67.

Keywords : hydrocarbons, aromatic hydrocarbons, metabolite, benzo

[a]pyrene, naphthalene, sediment, Prudhoe Bay crude oil, crude oil, accumulation, metabolism, concentration, gill, skin, muscle, blood, liver, bile, intestine, stomach, fish, Othree, salt water, biochemistry, sole, Prudhoe Bay, water

[ English sole exposed for 168 hrs to sediments containing

[<sup>3</sup>H] benzo

[a]pyrene and

[<sup>14</sup>C] naphthalene in Prudhoe Bay crude oil. Accumulation and metabolism of hydrocarbons measured; sediment concentration, sediment associated water concentration, radioactive concentrations in gill, skin, muscle, blood, liver, bile, stomach, and intestine.]

**Vargo, S. L., P. L. Lutz, D. K. Odell, E. S. Van Vleet, and G. D. Bossart.** 1986. Effects of oil on marine turtles. Anonymous. pp.ii,1-12. MMS 86-0070. Minerals Management Service. Washington, DC.

Keywords : turtle, South Louisiana crude oil, crude oil, review, behavior, avoidance, physiology, biochemistry, pathology, marine turtle, Othree, salt water, reptile, Louisiana, condition, mitigation

[ Exposure of young loggerhead and green turtles to South Louisiana crude oil under experimental conditions, literature review, and examination of a few stranded turtles; behavior, avoidance of oil, physiology, biochemistry, pathology, suggested mitigation actions.]

**Vauk, G.** 1984. Oil pollution dangers on the German coast. *Marine Pollut. Bull.* **15**(3):89-93.

Keywords : North Sea, Germany, oiled, bird, rehabilitation, spill, population, salt water, Oone, history, commentary, coast

[ Historical account and commentary of seabirds and oil pollution on the North Sea coast of Germany; covers 1960-83 and includes discussion on general ecological effects and oiled bird rehabilitation.]

**Vermeer, K.** 1976. Colonial auks and eiders as potential indicators of oil pollution. *Marine Pollut. Bull.* **7**(9):165-167.

Keywords : auks, species, water, eiders, population, spill, Canada, salt water, Oone, bird

[ Discussion of the seabird species to be of most use as indicators of the effects of oil pollution in Canadian waters.]

**Vermeer, K. and G. G. Anweiler.** 1975. Oil threat to aquatic birds along the Yukon coast. *The Wilson Bull.* **87**(4):467-480.

Keywords : bird, survey, species, spill, population, Yukon, development, salt water, fresh water, Oone, coast

[ Survey of aquatic birds along the Yukon coast in preparation for impending oil exploration; species accounts and statements of likely consequences of oil spills.]

**Vermeer, K. and R. Vermeer.** 1975. Oil threat to birds on the Canadian west coast. *Canadian Field-Naturalist* **89**(3):278-298.

Keywords : bird, survey, Canada, spill, species, history, population, salt water, fresh water, Oone, coast, pipeline, concentration

[ Survey and assessment of the threat to aquatic birds along the west coast of Canada from oil spills, especially from the impending completion of the Trans-Alaskan Pipeline; much detail on species concentrations and some historical information on world-wide oil spills.]

**Vignier, V., J. H. Vandermeulen, and A. J. Fraser.** 1992. Growth and food conversion by Atlantic salmon parr during 40 days' exposure to crude oil. *Trans. Am. Fish. Soc.* **121**(3):322-332.

Keywords : growth, food conversion, Atlantic salmon, salmon, crude oil, juvenile, concentration, Hibernia crude oil, feeding, physiology, biochemistry, muscle, liver, fish, Othree, fresh water, Atlantic, petroleum, water, rate, food

[ Juvenile Atlantic salmon were exposed to two concentrations of water-accomodated Hibernia crude oil for up to 40 da. Measured petroleum concentrations in water, feeding rates, food conversion and growth, plus characteristics of physiology and biochemistry in muscle, gut, and liver.]

**Waldichuk, M.** 1990. Sea otters and oil pollution. *Marine Pollut. Bull.* **21**(1):10-15.

Keywords : sea otter, North America, spill, Exxon Valdez, Prudhoe Bay crude oil, crude oil, mammal, salt water, Otwo, population, history, rehabilitation, coast

[ A historical and status report on sea otters of the the west coast of North America with particular reference to the significance of oil spills, including the Exxon Valdez spill.]

**Walters, P., S. Khan, P. J. O'Brien, J. F. Payne, and A. D. Rahimtula.** 1987. Effectiveness of a Prudhoe Bay crude oil and its aliphatic, aromatic and heterocyclic fractions in inducing mortality and

aryl hydrocarbon hydroxylase in chick embryo in ovo. Arch. Toxicol. **60**():454-459.

Keywords : Prudhoe Bay crude oil, crude oil, aliphatic, aromatic, nonhydrocarbon, chicks, embryo, toxicity, chicken, survival, physiology, metabolism, Oone, bird, Prudhoe Bay

[ Toxicity of the aliphatic, aromatic, and non-hydrocarbon fractions of Prudhoe Bay crude oil to chicken embryos; survival and physiological measures.]

**Walton, D. G., W. R. Penrose, and J. M. Green.** 1978. The petroleum-inducible mixed-function oxidase of cunner (*Tautogolabrus adspersus* Walbaum 1792): some characteristics relevant to hydrocarbon monitoring. J. Fish. Res. Board Can. **35**(12):1547-1552.

Keywords : mixed-function oxidase, cunner, monitoring, crude oil, dosed, tissue, liver, fish, Othree, salt water, aryl hydrocarbon hydroxylase, water, mussel, hydrocarbons, species

[ Exposure of the cunner to crude oil in water (15 da), force-fed crude oil (one dose, followed for 1 wk), or force-fed mussel tissue containing crude oil (every 2 da for 2 wk). Measured hepatic aryl hydrocarbon hydroxylase in an effort to confirm its usefulness as a monitoring species for oil pollution.]

**Walton, P., C. M. R. Turner, G. Austin, M. D. Burns, and P. Monaghan.** 1997. Sub-lethal effects of an oil pollution incident on breeding kittiwakes (*Rissa tridactyla*). Mar. Ecol. Prog. Ser. **155**():261-268.

Keywords : sublethal, kittiwake, Shetland, foraging, survival, blood, reproduction, Oone, bird, salt water, tanker, rate, nest

[ Assessment of the breeding success of kittiwakes at the closest colony breeding site to the January, 1993 wreck of the 'Braer' oil tanker in Shetland. Measured breeding timing and performance, foraging behaviour, return rates and survival of adults, fidelity in nest site and mate, and several blood characteristics during the years 1990-95. All measures were not performed all years.]

**Wang, R. T. and J. A. C. Nicol.** 1977. Effects of fuel oil on sea catfish: feeding activity and cardiac responses. Bull. Environ. Contam. Toxicol. **18**(2):170-176.

Keywords : fuel oil, No.2 fuel oil, sea catfish, feeding, activity, concentration, emulsion, experiment, survival, pathology, physiology, heart, Othree, salt water, fish, catfish

[ Sea catfish exposed to several concentrations of No. 2 fuel oil (oil-water emulsion) in laboratory experiments of 4 and 11 da duration. Activity, survival, feeding response, and cardiac function were measured; also some pathology.]

**Wang, S. Y., J. L. Lum, M. G. Carls, and S. D. Rice.** 1993. Relationship between growth and total nucleic acids in juvenile pink salmon, *Oncorhynchus gorbuscha*, fed crude oil contaminated food. Can. J. Fish. Aquat. Sci. **50**():996-1001.

Keywords : growth, juvenile, pink salmon, salmon, crude oil, food, Othree, North Slope crude oil, concentration, fish, nucleic acid, salt water, North Slope

[ Exposure of juvenile pink salmon to North Slope crude oil in food for 6 wks. Measured nucleic acid concentrations and growth of fish to see if the former could be used to evaluate the latter.]

**Wang, Z. and M. Fingas.** 1996. Separation and characterization of petroleum hydrocarbons and surfactant in Orimulsion dispersion samples. Environ. Sci. Technol. **30**(11):3351-3361.

Keywords : Orimulsion, surfactant, hydrocarbons, Online, technical  
[ Characterization of components of Orimulsion.]

**Wang, Z., M. Fingas, S. Blenkinsopp, G. Sergy, M. Landriault, L. Sigouin, and P. Lambert.** 1998. Study of the 25-year-old Nipisi oil spill: persistence of oil residues and comparisons between surface and subsurface sediments. *Environ. Sci. Technol.* **32**(15):2222-2232.

Keywords : spill, persistence, pipeline, Alberta, soil, petroleum hydrocarbons, ratio, degradation, weathered, crude oil, Oten, fresh water, miscellaneous

[ Presentation of the chemical results of a 1995 follow-up study of three pipeline ruptures that occurred in northern Alberta during 1970-72. Soil samples were in three groups; reference, 0-4 cm, 10-40 cm, and 80-100 cm. Measured total solvent-extractable material, total petroleum hydrocarbons, total n-alkanes, diagnostic weathering ratios, and other results from a detailed GC/MS analysis.]

**Weber, D. D., D. J. Maynard, W. D. Gronlund, and V. Konchin.** 1981. Avoidance reactions of migrating adult salmon to petroleum hydrocarbons. *Can. J. Fish. Aquat. Sci.* **38**(7):779-781.

Keywords : avoidance, salmon, aromatic hydrocarbons, Othree, salt water, fish, monoaromatic, numbers, concentration, behavior, Pacific, hydrocarbons

[ Migrating Pacific salmon were offered a fish ladder spiked with a mixture of monoaromatic hydrocarbons and an alternate that was not treated. Numbers of fish using the two ladder were counted to determine if avoidance occurred; regression of concentrations and numbers of fish.]

**Weiner, A., C. Berg, T. Gerlach, J. Grunblatt, K. Holbrook, and M. Kuwada.** 1997. The *Exxon Valdez* oil spill: habitat protection as a restoration strategy. *Restoration Ecol.* **5**(1):44-55.

Keywords : Exxon Valdez, spill, habitat, restoration, Prudhoe Bay crude oil, crude oil, salt water, Oten, habitat protection, injury, recovery, miscellaneous, natural resource

[ Description of the habitat protection aspect of the Exxon Valdez oil spill restoration process. Procedures and rational for the acquisition of land parcels as compensation for the natural resource injuries caused by the spill.]

**Weir, D. N., R. Y. McGowan, A. C. Kitchener, S. McOrist, B. Zonfrillo, and M. Heubeck.** 1995. Iceland gulls from the 'Braer' disaster, Shetland 1993. *British Birds* **88**(1):15-25.

Keywords : gull, spill, species, Shetland, United Kingdom, invasion, salt water, pathology, Oone, bird, necropsy

[ Necropsy results of 15 Iceland gulls that died during the 'Braer' oil spill in Shetland in 1993. The rare invasion of this species coincided with the oil spill. Necropsy results compared to those of other gull species.]

**Weslawski, J. M., J. Wiktor, M. Zajackowski, G. Futsaeter, and K. A. Moe.** 1997.

Vulnerability assessment of Svalbard intertidal zone for oil spills. *Estuarine Coastal Shelf Sci.* **44**(Suppl. A):33-41.

Keywords : vulnerability, intertidal, spill, Norway, Svalbard, coast, salt water, Oten, marine invertebrate, marine plant, bird, mammal, miscellaneous

[ A system for estimating the vulnerability of a coastline to oil spills. Physical and biological

characteristics of the intertidal zone on the Svalbard archipelago (Norway) were ranked as principal, important, or secondary and used to produce physical and biological indices.]

**Westernhagen, H. v. and V. Dethlefsen.** 1982. Effect of the surfactant Corexit 7664 on uptake of cadmium by organisms and biological matter in a closed circulated brackish-water system. *Helgolander Meeresuntersuchungen* **35**(1):1-12.

Keywords : dispersant, mussel, juvenile, flounder, concentration, combination, accumulation, tissue, liver, survival, species, growth, digestive gland, fish, marine invertebrate, bivalve, ODthree, salt water

[ Effects on common mussels and juvenile flounder of experimental exposure to one concentration of Cd and Corexit 7664, singly or in combination, for 400 da. Accumulation of Cd was measured in digestive gland and soft tissue of mussels and liver of flounder; also survival of both species and growth of flounder.]

**White, D. H., K. A. King, and N. C. Coon.** 1979. Effects of No. 2 fuel oil on hatchability of marine and estuarine bird eggs. *Bull. Environ. Contam. Toxicol.* **21**(1):7-10.

Keywords : fuel oil, hatchability, estuarine, bird, eggs, No.2 fuel oil, embryo, species, salt water, Oone, heron, gull, tern, Louisiana, eggshell

[ Effects on embryos of Louisiana herons, laughing gulls, and sandwich terns of eggshell applications of No. 2 fuel oil; field and laboratory portions of the study.]

**Whittaker, M. and S. J. T. Pollard.** 1997. A performance assessment of source correlation and weathering indices for petroleum hydrocarbons in the environment. *Environ. Toxicol. Chem.* **16**(6):1149-1158.

Keywords : weathered, crude oil, refined oil, degradation, index, Online, technical, petroleum, ratio, rate

[ Petroleum source assessment and weathering indices; compound ratios, weathering rates.]

**Whittaker, M., S. J. T. Pollard, and T. E. Fallick.** 1995. Characterisation of refractory wastes at heavy oil-contaminated sites: a review of conventional and novel analytical methods. *Environ. Technol.* **16**(11):1009-1033.

Keywords : review, methods, critique, soil, petroleum, Online, fresh water, technical, weathered

[ Review and critique of analytical methods available for analysis of soil contaminated with heavy petroleum products.]

**Wiens, J. A.** 1996. Oil, seabirds, and science. *The effects of the Exxon Valdez oil spill.* *BioScience* **46**(8):587-597.

Keywords : Exxon Valdez, spill, bird, species, toxicity, reproduction, population, habitat, Alaska, science, salt water, Oone, Prudhoe Bay crude oil, crude oil, commentary

[ Overall evaluation of the results of scientific findings of the effects of the Exxon Valdez on bird species and a commentary on some of the effects of the spill on the scientific effort; direct toxicity, reproduction, population resiliency, and habitat.]

**Wiens, J. A., T. O. Crist, R. H. Day, S. M. Murphy, and G. D. Hayward.** 1996. Effects of the *Exxon Valdez* oil spill on marine bird communities in Prince William Sound, Alaska. *Ecol. Appl.* **6**(3):828-841.

Keywords : Exxon Valdez, spill, marine birds, bird, Prince William Sound, Alaska, community, population, Prudhoe Bay crude oil, crude oil, multivariate, salt water, Oone

[ Evaluation of the effects of the Exxon Valdez spill on marine bird communities of Prince William Sound, Alaska in 1989-91; use of multivariate analyses.]

**Wiens, J. A., R. G. Glenn, and D. Heinemann.** 1984. Information needs and priorities for assessing the sensitivity of marine birds to oil spills. *Biol. Conserv.* **28**(1):21-49.

Keywords : marine birds, bird, spill, population, model, salt water, Oone, reproduction, survival, foraging

[ Discussion of the problems associated with modelling the effects of oil spills on marine bird populations; prioritizes information needs and presents reasoning for each information need.]

**Williams, J. M., M. L. Tasker, I. C. Carter, and A. Webb.** 1995. A method of assessing seabird vulnerability to surface pollutants. *Ibis* **137**(Suppl. 1):S147-S152.

Keywords : methods, vulnerability, index, risk, North Sea, bird, population, salt water, Oone, combination, density

[ Combination of an oil vulnerability index for seabirds with information on monthly site densities to produce 'potential risk' maps of the North Sea.]

**Williams, T. M.** 1990. Evaluating the long term effects of crude oil exposure in sea otters: laboratory and field observations. *Wildl. J.* **13**(3):42-48.

Keywords : long-term, crude oil, sea otter, oiled, Exxon Valdez, spill, physiology, weight, blood, habitat, Prince William Sound, Prudhoe Bay crude oil, reproduction, salt water, Otter, mammal, condition

[ Observations on the health of 12 oiled sea otters held in captivity for 12 months after the Exxon Valdez oil spill; long-term changes in coat condition, physiology, weight, blood, and reproductive status. Further comments on habitat conditions in the formerly oiled areas of Prince William sound.]

**Williams, T. M., R. A. Kastelein, R. W. Davis, and J. A. Thomas.** 1988. The effects of oil contamination and cleaning on sea otters (*Enhydra lutris*). I. Thermoregulatory implications based on pelt studies. *Can. J. Zool.* **66**(12):2776-2781.

Keywords : cleaning, sea otter, weathered, crude oil, dispersant, Corexit 9527, fur, mammal, Otwo, oiling

[ Effect on thermal conductance of sea otter pelts of oiling (fresh or weathered crude oil, or a crude oil -- dispersant mixture) and subsequent cleaning.]

**Wilson, K. W.** 1976. Effects of oil dispersants on the developing embryos of marine fish. *Marine Biol.* **36**(1):259-268.

Keywords : dispersant, embryo, fish, eggs, herring, plaice, concentration, fertilization, length, development, hatching, time, abnormalities, eye pigmentation, sole, Othree, salt water, heart rate,

sperm, petroleum, rate, eye

[ Exposure of eggs, sperm, and developing embryos of herring, plaice, and sole to varying concentrations of petroleum dispersants BP1002, Finasol ESK, and Corexit 7664. Measured effects on fertilization rate; heart-rate, length, and eye pigmentation during development; hatching rate, time to hatch, and larval abnormalities.]

**Wilson, K. W.** 1977. Acute toxicity of oil dispersants to marine fish larvae. *Marine Biol.* **40**(1):65-74.

Keywords : toxicity, dispersant, fish, larvae, haddock, herring, sole, plaice, concentration, survival, temperature, salinity, development, lemon sole, pilchard, salt water, Othree, embryo, age, starvation

[ Exposure of the larvae of haddock, herring, lemon sole, pilchard, plaice, and sole to varying concentrations of six oil dispersants. Measured survival, effects of temperature, salinity, stage of embryo development, age of stock solution, and starvation; and an assessment of the most toxic component of the dispersants.]

**Wilson, R. K., C. R. McCormick, T. D. Williams, and P. A. Tuomi.** 1990. Clinical treatment and rehabilitation of sea otters. Bayha K and Kormendy J (eds.), *Sea Otter Symposium, Biol. Rep.* 90(12), pp.326-334. U.S. Fish and Wildlife Service. Washington, DC.

Keywords : rehabilitation, sea otter, oiled, Exxon Valdez, spill, crude oil, physiology, mammal, Otter, salt water, fur, clinical treatment

[ Description of the clinical aspects of the rehabilitation procedure used to treat oiled sea otters at the Exxon Valdez oil spill.]

**Wilson, R. K., P. Tuomi, J. P. Schroeder, and T. Williams.** 1990. Clinical treatment and rehabilitation of oiled sea otters. Williams TM and Davis RW (eds.), *Sea Otter Rehabilitation Program: 1989 Exxon Valdez Oil Spill*, pp.101-117. International Wildlife Research.

Keywords : rehabilitation, oiled, sea otter, Exxon Valdez, spill, fur, physiology, crude oil, clinical treatment, mammal, Otter, salt water

[ Detailed description of the procedures and material used in the clinical treatment of sea otters admitted to rehabilitation centers following the Exxon Valdez oil spill.]

**Witham, R.** 1978. Does a problem exist relative to small sea turtles and oil spills? Anonymous. *Conference on Assessment of Ecological Impacts of Oil Spills*, pp.630-632. American Institute of Biological Sciences.

Keywords : turtle, spill, beach, Florida, vulnerability, Othree, green turtle, salt water, reptile

[ A report of three (two dead) young green turtles found on the beaches of Florida with evidence of oil exposure. Discussion of the vulnerability of young sea turtles to oil spills.]

**Wolfe, J. L. and R. J. Esher.** 1981. Effects of crude oil on swimming behavior and survival in the rice rat. *Environ. Res.* **26**(4):486-489.

Keywords : crude oil, behavior, survival, rice rat, thermoregulation, swimming, mammal, Otter, salt water, fresh water, rat, water, Texas

[ Effects on swimming behavior and thermoregulation of rice rats exposed to water contaminated with Empire and South Texas crude oils.]

**Wolfe, M. F., J. A. Schlosser, G. J. B. Schwartz, S. Singaram, E. E. Mielbrecht, R. S. Tjeerdema, and M. L. Sowby.** 1998. Influence of dispersants on the bioavailability and trophic transfer of petroleum hydrocarbons to primary levels of a marine food chain. *Aquat. Toxicol.* **42**(2):211-227.

Keywords : dispersant, transfer, petroleum hydrocarbons, food chain, Corexit 9527, Prudhoe Bay crude oil, crude oil, algae, naphthalene, toxicity, uptake, metabolite, depuration, rotifer, salt water, ODFour, marine invertebrate, marine plant

[ Effect of a dispersant (Corexit 9527) on the bioavailability and trophic transfer of petroleum hydrocarbons of Prudhoe Bay crude oil. A species of algae and a species of rotifer were used to measure trophic movement of  $^{14}\text{C}$ -labelled naphthalene in the water-accomodated fraction of crude oil with or without dispersant present. Measured toxicity (96 hr) and hydrocarbon uptake and hydrocarbon and metabolite depuration (16 hr).]

**Wolfe, M. F., G. J. B. Schwartz, S. Singaram, E. E. Mielbrecht, R. S. Tjeerdema, and M. L. Sowby.** 1998. Influence of dispersants on the bioavailability of naphthalene from the water-accommodated fraction crude oil to the golden-brown algae, *Isochrysis galbana*. *Arch. Environ. Contam. Toxicol.* **35**(2):274-280.

Keywords : dispersant, naphthalene, crude oil, algae, Corexit 9527, Prudhoe Bay crude oil, concentration, petroleum hydrocarbons, composition, uptake, labelled, ODSix, salt water, marine plant, Prudhoe Bay, petroleum, hydrocarbons

[ Assessment of the influence of a dispersant (Corexit 9527) on the bioavailability of naphthalene to the golden-brown algae. In a laboratory study, algae were exposed to the water-accomodated fraction of Prudhoe Bay crude oil or a chemically dispersed oil mixture;  $^{14}\text{C}$  naphthalene was added to both solutions. Measured concentrations of naphthalene and total petroleum hydrocarbons in solution, hydrocarbon composition of both solutions, and uptake of labelled naphthalene by algae.]

**Wolfe, M. F., G. J. B. Schwartz, S. Singaram, E. E. Mielbrecht, R. S. Tjeerdema, and M. L. Sowby.** 1998. Effects of salinity and temperature on the bioavailability of dispersed petroleum hydrocarbons to the golden-brown algae, *Isochrysis galbana*. *Arch. Environ. Contam. Toxicol.* **35**(2):268-273.

Keywords : salinity, temperature, petroleum hydrocarbons, algae, dispersant, Corexit 9527, naphthalene, Prudhoe Bay crude oil, crude oil, concentration, labelled, metabolite, ODSix, salt water, marine plant, Prudhoe Bay

[ Assessment of the influence of a dispersant (Corexit 9527) on the bioavailability of naphthalene to the golden-brown algae. In a laboratory study, algae were exposed to the water-accomodated fraction of Prudhoe Bay crude oil or a chemically dispersed oil mixture at two temperatures and two salinities;  $^{14}\text{C}$  naphthalene was added to both solutions. Measured naphthalene concentrations in solutions, concentrations of parent and labelled naphthalene in brown algae, and two naphthalene metabolites in solution and in algae.]



**Woodin, B. R., R. M. Smolowitz, and J. J. Stegeman.** 1997. Induction of cytochrome P4501A in the intertidal fish *Anoplarchus purpureus* by Prudhoe Bay crude oil and environmental induction in fish from Prince William Sound. *Environ. Sci. Technol.* **31**(4):1198-1205.

Keywords : fish, crude oil, Prince William Sound, tissue, Prudhoe Bay crude oil, Exxon Valdez, spill, gill, liver, stomach, intestine, gonads, mesentery, Othree, salt water, metabolism, monooxygenase, sediment, intertidal, experiment, methods, Prudhoe Bay

[ Induction of cytochrome P4501A (CYP1A) in tissues of an intertidal fish by residual Prudhoe Bay crude oil 15 mos after the Exxon Valdez oil spill. Fish from field collections, caged fish experiments, and laboratory exposure experiments were used to assess the effects of oil remaining in sediments. Immunohistochemistry methods used on gill, liver, stomach, gastric cacaes, intestine, mesentery, and gonad tissue.]

**Woodward, D. F., E. E. Little, and L. M. Smith.** 1987. Toxicity of five shale oils to fish and aquatic invertebrates. *Arch. Environ. Contam. Toxicol.* **16**(2):239-246.

Keywords : toxicity, fish, freshwater invertebrate, concentration, survival, fathead minnow, behavior, cutthroat trout, Colorado squawfish, Othree, fresh water, invertebrate

[ Exposure of three native fish and colonies of aquatic invertebrates on plate samplers to varying concentrations of water-soluble fractions of three crude shale oils and two refined shale oils. Measured survival of fish and invertebrates; and the predator success of Colorado squawfish and the prey success of fathead minnows.]

**Woodward, D. F., P. M. Mehrle, Jr., and W. L. Mauck.** 1981. Accumulation and sublethal effects of a Wyoming crude oil in cutthroat trout. *Trans. Am. Fish. Soc.* **110**(4):437-445.

Keywords : accumulation, crude oil, cutthroat trout, juvenile, concentration, survival, growth, pathology, fin, gill, fish, muscle, eye, fresh water, Othree, hydrocarbons, water

[ Exposure of juvenile cutthroat trout exposed for 90 da to four concentrations of the water-soluble fraction of a Wyoming crude oil. Measured survival, growth, pathology of caudal fin, gill, and eye; also, hydrocarbon analysis of water and fish muscle.]

**Woodward, D. F., R. G. Riley, M. G. Henry, J. S. Meyer, and T. R. Garland.** 1985. Leaching of retorted oil shale: assessing the toxicity to Colorado squawfish, fathead minnows, and two food-chain organisms. *Trans. Am. Fish. Soc.* **114**(4):887-894.

Keywords : toxicity, Colorado squawfish, fathead minnow, species, concentration, larvae, survival, growth, reproduction, metals, fish, tissue, neonate, daphnia, mayfly, fresh water, freshwater invertebrate, Othree, acute

[ Exposure of Colorado squawfish, fathead minnows, a daphnia species, and a mayfly species for 30 da to varying concentrations of retorted shale leachate; also 96 hr acute toxicity tests for daphnia neonates and fathead minnow larvae. Measured survival, growth, reproduction of daphnia, anions and cations in leachate, and metals in fish tissue.]

**Woodward, D. F., R. G. Riley, and C. E. Smith.** 1983. Accumulation, sublethal effects, and safe concentration of a refined oil as evaluated with cutthroat trout. *Arch. Environ. Contam. Toxicol.* **12**(4):455-464.

Keywords : accumulation, concentration, refined oil, cutthroat trout, refinery, survival, growth, gill, pathology, liver, swimming, muscle, fin, fresh water, Othree, fish

[ Exposure of cutthroat trout for 90 da to five concentrations of an unidentified refined oil seeping from a refinery site. Measured survival, growth, gill pathology, liver pathology, caudal fin erosion, caudal fin pathology, swimming performance, and muscle concentration.]

**Wootton, T. A., C. R. Grau, T. E. Roudybush, M. E. Hahs, and K. V. Hirsch.** 1979.

Reproductive responses of quail to Bunker C oil fractions. Arch. Environ. Contam. Toxicol. **8**(4):457-463.

Keywords : quail, Bunker C, solvent extract, fuel oil, reproduction, Japanese quail, toxicity, Oone, hatchability, embryo, bird, solvent, research

[ Effects of single doses of solvent extracts of Bunker C fuel oil on reproduction of Japanese quail. The purpose of the research was to identify the toxic fractions of Bunker C responsible for observed toxic effects.]

**Wright, A. L., R. W. Weaver, and J. W. Webb.** 1997. Oil bioremediation in salt marsh mesocosms as influenced by N and P fertilization, flooding, and season. Water, Air and Soil Pollution **95**(1-4):179-191.

Keywords : bioremediation, crude oil, fertilization, nitrogen, phosphorus, salt water, salt marsh, Spartina, marine plant, Oten, miscellaneous, water

[ Crude oil bioremediation in salt marshes; salt water, fertilization.]

**Wu, R. S. S., P. K. S. Lam, and B. S. Zhou.** 1997. A settlement inhibition assay with a cyprid larvae of the barnacle *Balanus amphitrite*. Chemosphere **35**(9):1867-1874.

Keywords : assay, larvae, barnacle, concentration, dispersant, diesel fuel, behavior, ODfour, marine invertebrate, salt water

[ Exposure of cyprid larvae of the barnacle *Balanus amphitrite* to various concentrations of the three dispersants, Vecom B-1425, Norchem OSD-570, and Corexit 9905, and diesel fuel for 6 da. Measured percentage settlement of larvae on an experimental surface.]

**Wu, R. S. S., P. K. S. Lam, and B. S. Zhou.** 1997. Effects of two oil dispersants on phototaxis and swimming behaviour of barnacle larvae. Hydrobiologia **352**(1):9-16.

Keywords : dispersant, swimming, barnacle, larvae, diesel fuel, survival, behavior, toxicity, phototaxis, ODfour, salt water, marine invertebrate, static

[ Exposure of stage II nauplii of barnacle *Balanus amphitrite* to various mixtures of two dispersants, Vecom B-1425 GL and Norchem OSD-570, and diesel fuel. Measured survival, phototaxis, and swimming behavior during 24 and 48 hr static toxicity tests.]

**Xiong, Z.-T., H.-X. Hu, Y.-X. Wang, G.-H. Fu, Z.-Q. Tan, and G.-A. Yan.** 1997. Comparative analyses of soil contaminant levels and plant species diversity at developing and disused oil well sites in Qianjiang oilfield, China. Bull. Environ. Contam. Toxicol. **58**(4):667-672.

Keywords : freshwater plant, crude oil, oilfield, soil, Oseven, China, fresh water, plant, oiled

[ Plants growing on oiled soil at a Chinese oilfield.]

**Yarbrough, J. D., J. R. Heitz, and J. E. Chambers.** 1976. Physiological effects of crude oil exposure in the striped mullet, Mugil cephalus. Life Sciences **19**(5):755-760.

Keywords : crude oil, striped mullet, Empire Mix crude oil, estuarine, liver, weight, gill, muscle, biochemistry, pathology, Othree, salt water, fish, mullet, ecosystem

[ Exposure of striped mullet for 20 da to Empire Mix crude oil spilled on the surface of a simulated estuarine ecosystem. Measured body and liver weight; gill, liver, and muscle biochemistry; and some pathology.]

**Zanadri, E., M. C. Bicego, L. B. De Miranda, and R. Weber.** 1999. Distribution and origin of hydrocarbons in water and sediment in Sao Sebastiao, SP, Brazil. Mar. Pollut. Bull. **38**(4):261-267.

Keywords : distribution, origin, petroleum hydrocarbons, water, sediment, aliphatic, aromatic hydrocarbons, Oten, salt water, miscellaneous

[ Determined the distribution and origin of hydrocarbons in water and sediment near Sao Sebastiao Island, Brazil. Collected 20 samples of water and sediment in February 1994. Analyzed samples for aliphatic and aromatic hydrocarbons and compared results according to three site groupings within the sample collection.]

**Zhou, S., H. Heras, and R. G. Ackman.** 1997. Role of adipocytes in the muscle tissue of Atlantic salmon (*Salmo salar*) in the uptake, release and retention of water-soluble fraction of crude oil hydrocarbons. Marine Biology **127**():545-553.

Keywords : tissue, muscle, uptake, depuration, crude oil, hydrocarbons, aromatic hydrocarbons, adipocytes, Atlantic salmon, Othree, salt water, fish, Atlantic, salmon

[ Uptake and depuration of WSF of crude oil by Atlantic salmon.]